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EUTHERAPEIA.

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EUTHERAPEIA;

OR,

AN EXAMINATION OF THE PRINCIPLES

OF

MEDICAL SCIENCE,

WITH

RESEARCHES IN THE NERVOUS SYSTEM.

BY

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PREFACE.

In offering the following pages to the Public the Author has no intention to maintain that the Medical Art has arrived at perfection, or even approached that state; those who have practised it the longest, a Heberden, an Abercrombie, and a Holland, have pronounced otherwise. He merely hopes to set its claims in a fair position, at the same time that he admits, nay, endeavours to elicit, its deficiencies, in humble desire that some of his (perhaps too immature) reflections may haply cause the attention of the student, or possibly of the more advanced philosopher, to be directed to points in our cherished art where there may be a prospect or need of discovery.

Many of the defects of Medicine arise from its acknowledged difficulty, too many have originated from the prevalence of hypothesis, and others from our indolence and apathy in the search after that knowledge which is only to be derived from truthful and patient observation. These will recur to our notice hereafter.

But there are other causes which have probably retarded the progress of Medicine in our own country in particular.

Many have felt, at least up to the last few years, that there is less encouragement for the prosecution of scientific medicine, or at least of original research, in this than in some other countries. On the continent the philosopher has frequently occupied a high position : at any rate hospital and other medical appointments, whether civil or military, are commonly bestowed by *concours*, whilst with us such positions are often obtained in a somewhat objectionable way, through personal favour or family interest. A late eminent surgeon and physiologist was accustomed to observe, that every research in which he was engaged had a prejudicial effect on his practice. As a nation we look too often to present results ; much of the real greatness of the first French Emperor, on the other hand, consisted in his appreciation of excellence and its effect on the future. Fortunately the pleasures of scientific pursuits constitute, themselves, their best rewards.

In this country, too, the constitution of the profession is, and always has been, anomalous ; and errors in medical as well as in civil legislation have generally a bad influence on the community. The great body of those who pursue the medical art in England have no *Alma Mater*. A trading guild is invested with the high powers of creating the majority of the medical practitioners throughout the land, whilst its office ought rather to be the regulation of the art of the *pharmacien* or dispensing apothecary, and the suppression of the dangerous charlatanism and *nostrums* for which England is so notorious. The College of Surgeons receives large fees from its members, and yet, virtually, does not confer upon them even the power to practise surgery, for it has never prosecuted those who practise the art without its diploma, which the most illiterate quack frequently does, with less

responsibility to the law in case of malpractice, than the qualified practitioner. To the College of Physicians and the two Universities, perhaps not more than a quarter of the country physicians belong, neither do they acknowledge the authority of the same, being, in fact, as far as the extant laws are concerned, unqualified practitioners.

We, however, recognise the merits of all these bodies. The first, of late years, has done more than might be expected from it; and the College has been fortunate in the acquisition of endowments for lectures and prizes, of distinguished Professors and Curators, and of the Hunterian Collection, the present state of which renders it one of the proudest possessions of science, and an *amende honorable* for the destruction of Hunter's folios of illustrative manuscript.* But we might have expected more from the Royal College than zootomical and microscopical pursuits, and we must not close our eyes to the fact, that a large body of intelligent men, practising one of the learned professions in a great nation, has been allowed to continue for ages in a humiliating state of unorganization.

As is generally the case, however, it is more easy to find fault than to point out a better plan; but we trust that there are a few plain indications of cure in this case, as there are in other disorders. And, perhaps, the wise physician would rather endeavour to restore the perverted functions, it may be by some unpalatable remedies, than attempt to reconstruct the body medical entirely anew.

Let the Worshipful Company properly regulate the prac-

* A copious Synopsis of the contents of this Museum would be useful, and, together with a catalogue of the excellent library, might be presented *gratuitously* to each member.

tice of pharmacy, the College of Surgeons continue to give diplomas in surgery, and the College of Physicians descend somewhat, and take in such graduates of Medicine throughout the land as are entitled to the astute distinction of treading in the footsteps of Linacre or Harvey. Let all invidious distinctions, such as those of *permissi in* and *extra urbem* (a town patient being made of the same "stuff" as a country one) be annulled, or at least conferred according to seniority and attainments, and not by favour or an additional fee.

But in this country, owing to the tardy progression of these bodies, another class of medical men, called *general practitioners*, has sprung up, which is not identical with any one of them; and, therefore, another college has become necessary, with its council, into the mode of nominating which we shall not enter; but to which might be intrusted the power of licensing and registering, and, when needed, examining all practitioners; of prescribing a proper qualification either as to course of study, or diplomas from other colleges; being ready, likewise, to give advice in all matters of public Hygiene; to recommend properly qualified individuals to fill important civil or military medical offices —exercising, in fact, those necessary powers which the other Colleges, from their supineness, have allowed to lapse.

In the following pages, however, the author proposes to review the state of medicine under a scientific, rather than a political, aspect. A glance at the Table of Contents will show how he has arranged his subject. With respect to the anatomy of the nervous system, he hopes that he has, in the text and in the figures, presented some little original matter. As to the chapter on materia medica, he may

observe that he has not wanted the opportunity, nor the inclination, to examine the substances described, some of them rare foreign productions. The subject of the seventh chapter, a kind of Bridgewater Essay, has long been a favourite study with him; and in reference to the concluding one, on the various forms of pseudo-medical science, he trusts that it has not been written with more acerbity than a proper zeal for the honour of the Profession demands.

The author's principal object has been to demonstrate that considerable reliance may be placed upon the present theories and practice of medicine, bearing in mind, however, that more light remains to be shed on very many medical subjects, and that all human opinions and doctrines are liable to error. It is demonstrable enough that the foundations of Medicine must ever be the truths of Anatomy and Organic Chemistry; and he hopes he has shown that the former has now arrived very near to perfection, and that the latter also is making rapid progress. In the various heterodox systems both these sciences are totally ignored. With respect to disease itself, he has endeavoured to elucidate, that, in many general diseases, a rational plan of cure exists in aiding or regulating the efforts of Nature herself to restore the organism to health; but when we come, as in the Fifth Chapter, to changes of structure rather than diseased actions, or what are called organic diseases, which the disciples of other systems explicitly abandon as too unpromising,* he maintains that his art, Medical or Surgical, still shows her power—in many cases it can effect a cure; in more, prolong life. He next endeavours to point out a benignant Providence and dispensation even in the per-

* Hahnemann's "Organon," Lane's "Life at the Water Cure."

mission of disease and pain, and especially in the existence of agents to cure or alleviate both. Of the last Chapter, a review of the different unfounded systems of Medicine and Physiology, he has already in the preceding paragraph sufficiently spoken.

He has written for the Profession in the first place, but also with an eye to the inquiring portion of the community—with what success he leaves to their indulgent judgment to decide.

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CHAPTER I.

Introduction—The claims of legitimate in opposition to false medical science—Anatomy: its rise, progress, and present state of perfection—An introductory review of the different systems of organs and their functions.

To elucidate the credibility of the Principles of Medicine, to show that these principles may not unfairly be placed in comparison with the accredited conclusions of other kindred sciences, and to vindicate our art amidst the pretensions

and dogmas of charlatanism—to meditate for a short time on the origin and sad prevalence of disease, to investigate the degree of curative power furnished us in remedial agents, and to compare diseases and their cures and alleviations with corresponding evils and their remedies in the moral world—to elucidate, too, the existence of a governing power or degree of inherent curative tendency in the human frame, manifested in the regular course or order of phenomena or symptoms in what are in this respect wrongly called disorders, but, above all, in that happy constitutional aid during their treatment, which we experience in most diseases: to consider to what extent these effects may be relied upon—lastly, the indication of a visible intention and even of goodness in the permission by Providence of disease and pain* —such are the subjects which the author would wish to discuss in the following pages. In doing so, he will not confine himself to the present state of our art, but will also take a retrospective glance at its past rise and progress.

The science of medicine has, in all ages, with the intelligent and feeling, occupied a high position. It particularly concerns ourselves—its triumphs the alleviation and cure of a considerable portion of our miseries. We will not quote the heathen philosophers in testimony to its importance or its celestial origin. The Divine Founder of Christianity, with his high commission to his apostles to preach the Gospel, at the same time empowered them to cure the sick. His own miracles were, many of them, those of healing inveterate or incurable maladies, palsies, fevers, epilepsies, insanity, spinal distortion, leprosy, blindness, deafness, and hæmorrhage; sufficient proofs, if our own personal experience, unfortunately, did not afford them, of the urgency of the calls which sickening humanity makes for assistance.†

* On several of these points the author has been anticipated by Dr. Duncan, in his little book, entitled, "God in Disease," 1851; a pleasing addition to our *Biblia Medica Sacra*.

† It has been observed, that without the aid of the physician, some single diseases alone, as small-pox, would have gone far towards extir-

Our art, requiring light and assistance from many other sciences, liberally repays on all sides what it borrows. Its humblest professor, too, may pursue the most interesting inquiries; nor need he confine his thoughts to our frail bodies alone; subjects of a higher nature are connected with them, and present themselves to his consideration—matter animated by the vital force, and moreover connected with the mental and immortal part of the human entity.

Far from claiming, as observed already, infallibility for our art, and admitting its deficiencies from causes above alluded to, and from the misapplication of physical laws to explain vital phenomena, aware, too, of the great difficulties attending its study, the occult nature of many diseases, the obscurity in the *modus operandi* of medicines, the variations in individuals from temperament, habits, and passions, rendering experiment difficult and fallacious, yet we must maintain that the science is, upon the whole, the legitimate growth, for a succession of ages, of reason and observation. Its foundations are strengthened by the acknowledged truths of anatomy, chemistry, and natural philosophy. Our remedies are often not only indicated by theory, but proved by experience, and this last both traditional and of our present time, by their chemical and physical nature, as well as having in most cases effects very capable of demonstration. In few cases do medicines rest upon undemonstrable supposition alone, and we should ever entertain doubts of all such empirical remedies. With respect to the powers of medicines, as well as with regard to many of our pathological doctrines, we often have an accumulation of evidence.

The pseudo-medical professors of the present day are, on the contrary, challenged to demonstrate the power of their

pating our race. In the time of Sydenham one quarter of the mortality of London arose from four diseases—plague, small-pox, dysentery, and scurvy,—which, though still as inherently virulent, are rendered harmless by the knowledge which we have of their etiology, enabling us to accomplish their prevention.

ridiculous medicines by visible proof. They rather prefer, like Paracelsus of mediæval times (but many of them with not a tithe of the genius and imagination of that prince of empirics), to invent bold dogmas which are palmed upon the credulity of the age as certain truths. Experimental inquiries, but on weak and nervous individuals, are made to prove the same, as they might be made to prove anything; and if of a medical nature, deceptive statistics have been sometimes added, as will again be noticed, and the whole is palmed upon such of the public as are ever credulous of novelty, and contemptuous of old established truth.

It is interesting, in a psychological point of view, to examine the characters of those who are led astray by these various delusions,—whether they are of the *sceptical* class, who delight in doubting all for which there are good grounds of belief, but at once admit whatever is proposed contrary to the received opinion,* or the *credulous*, whose love of the marvellous has no bounds, and who, curiously enough, follow in the footsteps of the first, their natural antipodes. Indeed these last are often of the serious and religious portion of society, but their religion sometimes burns too coldly to enable them to trust those means of cure which a kind Providence has bestowed upon us; or, in case a perfect restoration is impossible, to bear with resignation the inconveniences which are probably ordained for their trial. In spite of the best directed human efforts, man is but of dust and "born to trouble," or, if the physician must not use such language, we may quote the more laboured words of Cabanis:—"La mort est le terme inevitable de la vie; la douleur est, aussi bien que le plaisir, l'apanage de tous les êtres sensibles. Il est dans la nature de souffrir et de mourir, comme de vivre et d'avoir des sensations agréables: il est dans la nature d'être malade, comme d'être sain." Forgetting this truth, even men of great capacity and high

* This school has almost taken its title from a name honoured in our art, the possessor of which has already received the ungallant but not undeserved castigation of more than one writer.

mental attainment, "have been known to become converts to the most grovelling imposture, and dupes of the vilest quackery."*

Orthodox medical science, standing in perfect hostility to certain of these systems, it follows that one or other must be false, and this it is proposed in due course to examine. To do so, *solely*, however, would be scarcely worth our trouble. Besides the objects already mentioned, we shall also endeavour to examine the degree of reliance which may be placed on our science; and if, though we vindicate its principles, it appears evident that there still remain deficiencies and uncertainties in it, yet it must then be recollected that there are the same in all kindred sciences—in ethics, politics, and even theology itself; yet at the same time these are not such as (in the language of Butler) exclude probabilities and certainties sufficient to exact our acting with considerable confidence in the result. Ours is not the only pursuit in which success must sometimes depend upon the calculation of probabilities.

Sir G. Blane observes:—"With regard to the vagueness and uncertainty of physic, in its principles as well as practice, all the maxims and practical operations of human life lie open to the same objection. They all consist of facts and principles which do not admit of mathematical precision; being made up of averages and approximations, all liable in various degrees to error and deception." To prove that medicine is not a mathematical science is by no means to prove that it is no science at all. It may also be observed, that certain of its defects originate from those of other sciences; were the metaphysicians, for instance, more agreed with regard to the faculties of the mind, the nature and treatment of insanity might be less obscure.

* Sir G. Blane, El. of Med. Logic. One reverend gentleman, in his published "Sermon," does not hesitate to consider that Homœopathy alone is "the medicine of love, preparing the way for the gospel of love." If our art, orthodox, old-fashioned physic and its practitioners, have not been distinguished by love and beneficence, we should scarcely know where to find a greater measure of these virtues.

But exact reasoning and calculation, particularly statistics, may be applied in many cases in medicine. The vital force is still and ever will be a mystery; but so, in reality, is gravitation, or electricity, or caloric. The first differs from the rest in being peculiarly the force of organisms; its laws, though more complicated, are equally amenable to observation, and there is, as has been observed, a correlation among all such principles.

A knowledge of the structure of the human frame has ever been considered as one of the main foundations of medicine; so far as the former is perfectly known, so far will the latter flourish. It is important in all branches of medicine; yet it might be an interesting subject for inquiry, to what extent our art, in different ages, has been practised without it. That it is indispensable in manual medicine or chirurgery is apparent enough; it is almost equally so in such cases as jaundice, heart affection, or apoplexy. There are some diseases, however, which under ordinary circumstances, might be well treated without anatomical knowledge, such as fevers or epidemics. It is in the observation and description of such complaints alone that we still look up to Hippocrates or Aretæus as our masters; in most diseases it is far otherwise.

But in considering this question, we must bear in mind (for instance, with respect to the great men just mentioned), that an ignorance of human anatomy does not imply an ignorance of anatomy in general. We cannot doubt that Hippocrates obtained much insight into the vital organs of man, from the study of those of brutes, as well as from the traditional lore of the Asclepiades. The Greeks and Romans, though natural science does not appear ever to have taken deep root with them,* were too interested in all relating to man to have been indifferent to anatomy. There

* Aristotle, however, was a remarkable exception. Zoologists have found that his narratives, formerly supposed to be fables, are commonly correct. See Forbes's Lycia, also Cuvier.

is, too, a natural tendency in man to pry into the secrets of his own body; the philosophic mind will pore over a skull or skeleton, or the interior of animals slaughtered for food or sacrifice. Omai, the South Sea islander, is said to have shown a considerable degree of anatomical knowledge when he visited Surgeon's Hall. Two or three centuries before the Christian Era human anatomy flourished at Alexandria, of which we have undoubted testimony, and the knowledge acquired must have spread thence into other lands. It was there that Herophilus and Erasistratus, under the patronage of the Post-Alexandrian dynasty, pursued the science, evidently, from what we find respecting them in Galen and other authors, with great success.

The Romans, then, could not be ignorant of the peculiarities of the human frame; certainly neither Celsus nor Galen. This latter great man was born about A.D. 131, at Pergamos, celebrated for its temple to Æsculapius. Speaking of his works, Portal observes:—"On y découvre mille découvertes que les anatomistes, qui lui ont succédé se sont attribuées, et on trouvera dans cet auteur des descriptions plus exactes que dans beaucoup de livres modernes." Moir (Delta) writes in his valuable little work, "Like all other really and truly great men, Galen was vividly impressed with the beauty of holiness. Whenever he enters on the contemplation of the magnificent or beautiful in the external world, or in the examination of the exquisite in texture and conformation, his soul expands with a noble and admiring enthusiasm. He expatiates on the beneficence, the benignity, and wisdom of the eternal Being, who created the universe, and delights to linger over the traces and tokens of his handiwork everywhere curiously outspread around him. Some authors have asserted that Galen, from a conviction of the truth of the miracles performed by our Saviour, became a Christian, and died whilst on a journey to Judea."* After this great man, however, anatomy,

* Moir's "History of Medicine" (on Chartier's authority) and Portal.

generally speaking, declined ; the want of knowledge of the circulation of the blood was one of the great deficiencies of the ancients. Yet it appears that Nemesius, one of the successors of Galen, knew much of this phenomenon—to this, however, we will revert further on. The ancients did not understand the important distinction between nerves, muscles, and tendons.

A knowledge of anatomy and medicine has often been attributed to those remarkable priests of antiquity, resembling each other in many particulars, the gymnosophists of India, the *magi* of Egypt and Assyria, and the Druids ; and Democritus and Pythagoras are thought to have obtained the knowledge of anatomy, which they probably possessed, from these men. Clemens Alexandrinus considers the Druids to be identical with the Shamans, and the account of one of these Eastern priests or prophets in the Pentateuch, Balaam, might lead us to suppose him to have been not very different from those of Britain. The celebrated passage in the last chapter of Ecclesiastes is instanced by Mead* and Le Clerc as a proof of the knowledge which the Jews possessed of the structure of the body, as it has been of their acquaintance with the circulation. The latter idea appears incorrect, but it is pretty evident that the passage is a beautiful, correct, and particular allegory of the

* See Mead's "Dissertations on the Diseases Mentioned in Scripture." With respect to demoniacs, the pious author takes what appears to us to be the correct view. He supposes these individuals to have been either lunatics, epileptics, or simply diseased, and that Christ did not think fit, in speaking of them, to use other than the popular language and expressions. We cannot imagine them to have been any more possessed than many lunatics are, who have their moral feelings entirely perverted, believe themselves possessed, and certainly have the spirit of evil and destruction all dominant in their minds. Is it indeed very incorrect to say that such individuals are possessed, when they commit a murder on an innocent or unprepared victim, the great spirit of malevolence exciting them, though they themselves may not be amenable for their actions? See a summary of the arguments on both sides this question in Kitto's "Biblical Cyclopædia."

decay of the organs in old age. A knowledge of the human structure has also been attributed to the Essenes, who may probably have originated some of the cabalistic doctrines of medicine. Neander writes :—"The Essenes sought to explore the powers of nature, and apply them to the healing of diseases. Connected with their secret doctrines was a traditional knowledge relating to the subject. They were in possession of old writings which treated of such matters. Health of body and of soul they were in the habit of connecting together as well as the care of both."

The Hindoos were acquainted with many of our medicines long before they were discovered by Europeans; also with several surgical operations, as that for cataract, and with rhinoplastics, or the art of restoring the nose, often mutilated by Oriental cruelty. They cured hydrocele with a poultice of indigo leaves and sal-ammoniac. Sir W. Jones found a description of the structure of the human body in a fragment of one of the Vedas.*

The spread of Christianity had at first, as might upon reflection have been expected, a retrogressive effect upon the progress of our science. From the prevalence of miraculous interpositions and healings, and the hope of obtaining such powers, the study of magic began to take the place of science. The memory of Erasistratus obtained the execration of the otherwise enlightened Tertullian, on account of his zeal in anatomy. Independently of this a long night of darkness was now about to overspread the world. It was in the East that the sun of medical science again arose.

But however well the subtle Oriental mind may be suited to medical studies, their religious creeds, whether of Bramah, Buddha, or Mahomet, like the byegone Pagan superstition of the West, would render the study of anatomy nearly impossible. The Arabs, in the height of their splendour and

* We have accounts of many Oriental medical treatises which are extant in Cingalese, Sanscrit, and Tamool, the latter generally in verse: there were many in Persian and Arabic, the latter translations from the Syraic, in Tippoo Saib's library. See Stewart's Catalogue in Ainslie.

prosperity, were therefore only copyists of the Greeks. Mesue was a Nestorian Christian. Avicenna, it is said, was born at Bokhara, Ispahan being the scene of his career; brilliant but irregular, it ended at last by poison. Two eminent Arab physicians, Avenzoar and Averrhoes, flourished in Mahometan Spain; the former, unlike Avicenna, by temperance and regularity prolonged his life to much more than a century; the latter is reported to have been more illustrious for his talents than for the orthodoxy of his creed. Still less is known of the history of Albucasis. One of his works was translated into Latin from manuscripts at Oxford; another manuscript was procured by the traveller Pocock. To the early Venetian press, however, we are indebted for editions of the works of most of these Eastern writers. It appears that the Arabs ventured to extract the stone, and open the trachea in some cases; they also applied the moxa for the relief of internal pains *

Although the Mahometan dispersion of the Alexandrian school and other Saracenic revolutions gave rise to three remarkable universities, which became celebrated, in a medical point of view, Salerno,† Bologna, and Montpellier, yet the general eclipse of knowledge above alluded to long continued in the Christian world. The priests were almost the only physicians, and these were forbidden to meddle with blood; and *post-mortem* investigations were interdicted by ecclesiastical authority. With these sacerdotal physicians and bolder monkish surgeons, certain charlatans, heretics, and astrologers, often disputed the field. We may, however, trace the origin of chemistry to these times and to such men—to a Friar Bacon, Albertus Magnus, Arnoldus de Villenova, and Paracelsus. Arnoldus, like Vesalius, was

* The names by which we distinguish the above writers are often different enough from their real names. Mesue was translated by Sylvius, and Avicenna by Arnoldus.

† See Freind's account, and an interesting article in the "Penny Cyclopædia."

wrecked (on the coast of Genoa), the victim of religious persecution.

At length anatomy, that useful and interesting science, but only to be cultivated by industry in the examination of our poor remains, was, at the dawn of the Reformation, destined to take its proper place in human investigations. When the cultivation of knowledge has not interfered with the paramount pretensions of Rome, we cannot accuse her, at least with regard to our art, of unvarying discountenance, we should not forget that the first and greatest professors of human anatomy arose in Italy. There, about the same time that Guy de Chauliac was restoring surgery to its proper position in France, Mundinus appears to have been the originator of anatomy ; in Italy, too, the first works on it were published, often under the auspices of popes and cardinals, and in some cases, curiously enough, dedicated to their nieces or daughters.* However, anatomists did not escape ecclesiastical tyranny altogether. The Inquisition drove Berenger de Carpi into exile, and C. Stephens, together with other members of his illustrious family, did not remain intact. On the other hand, Protestants must blush for the intolerance and barbarity of Calvin in burning Servetus, a truly great man, and who really appears to have anticipated to a considerable extent our Harvey in his great discovery. Servetus had already been persecuted and condemned by the Roman inquisitors at Thoulouse and in Germany, but this appears a poor excuse ; he was arrested in violation of the law of nations and of hospitality, and other circumstances of meanness took place on his trial.†

* To Lucretia, daughter of Alexander VI., for instance. The Tab. Anat. of Eustachius was published by Lancisi, under the patronage of Clement XI. The fine portrait of his nephew, Cardinal Albano, accompanies the dedication.

† Portal relates, " Un hérétique en fit perir un autre : mais la difference c'est qu'un fourbe et un ignorant prononça la condemnation, et qu'un des plus beaux genies qu'ait eu l'Europe, en fut la triste victime." This is the sentiment of a Romanist, but judging from that of Mosheim, we shall still see in Servetus a powerful and original mind,

Long, then, before the labours of the industrious *trio*, Vesalius, Eustachius, and Fallopius, Italy and Bologna in particular had become the seat of the science. Gabriel de Zerbus, Achillinus, Carpi, and Massa, had already flourished. In France, towards the middle of the sixteenth century, Francis I. sent for Vidus Vidius from Italy, to the royal college which he had founded, and to this event we are indirectly indebted for a Sylvius, La Vasseur, Fernel, Andernach, Vesalius, Rondeletius, and Fallopius. Even semi-barbarous England began to have her students in anatomy.*

The latter part of the life of Vesalius, the prince of anatomists, was obscured by dark misfortune. He was born at Brussels, in 1514, and, as other eminent medical men have been, was of a family distinguished in our science. At Paris, amidst numerous discouragements, he devoted himself ardently to anatomy. He was appointed Professor at Pavia, Bologna, and Pisa, and published the plates in which, according to Portal, Titian lent his aid in 1539. Eustachius at Rome, Driander and the selfish Sylvius, at Paris, became his bitter foes, accusing him of ignorance, arrogance, and impiety, and branding him with the cogno-

it may be, "obstinate, contentious, and arrogant," and relying too much, perhaps, on its own powers in theological matters, but its possessor worthy of a very different fate. When burnt his book was fastened to his thigh, and his last prayer was addressed to his Saviour, and apparently acknowledged his deity. His work was destroyed as well as himself, but a copy was secured by one of his judges, D. Colladen, which is now in the Royal Library at Paris, and a portion of it in manuscript in the Library of the London College of Physicians. Pettigrew's Med. Biography. Portal. Wallace.

* For instance, Herman, Anatomia corp. human. 2 lib., died 1535. Douglas and Eloy. Bart. Glanville, de proprietatibus rerum, 1481. John Hall, a very fruitful and necessary brief work of Anatomy, &c., 1562. John Banister, the History of Man, sucked from the sappe of the most approved Anatomists, for the utility of all godly Surgeons, &c. Lond., fol., 1578. Vesalius was translated into English 1553, and dedicated to Edward VI. Collins, in 1685, published his System of Comp. Anat., still a valuable work.

men Vesanus. Fallopius alone, in these disputes, showed more respect to his master, and probably was more competent than any living man to estimate him. Vesalius was at last accused of impiety, and to expiate his crime had to make a pilgrimage to the East; returning, at the invitation of the Venetians, to occupy the chair vacant by the death of Fallopius, at the early age of thirty-five, he was wrecked on the island of Zante, A.D. 1564. He could not, as is said, have perished of hunger, as the island was at that time inhabited by a civilised people. At the present time no trace of his tomb exists in the island, only an ancient tradition that "his body was received by the Capuchins of the Latin Convent of St. Maria delle Grazie, and was buried in the church of that cloister."*

In the person of Vesalius the more serious persecutions of anatomists ceased.† Fabricius, the master of Harvey, occupied his place, and Padua possessed a succession of eminent anatomists down to the illustrious Morgagni. The excellent Ingrassias of Palermo, with Severnius and Cotunnius, flourished in the kingdom of Naples; Arantius, Varolius, Malpighi, and Valsalva, honoured Bologna; Columbus, Rome; Vanhorne, Swammerdam, Ruysch,‡ Bidloo,§ and Albinus, have adorned Holland; Bartholinus and Steno, Denmark; Rudbeck, Sweden; Plater, Bauhin,|| and the great Haller, Switzerland; France has had her Duvernay, Winslow, Vieussens, Lieutaud, and Vicq d'Azyr; England has produced a Willis to demonstrate the nerves and heart; Wharton the glands; Glisson and Mayow the liver and

* Original communication from Zante.

† Winslow, mentioned below, was by birth a Dane, the nephew of Steno, but was expatriated after his conversion by Bossuet. Van Swieten was equally unlucky in Holland.

‡ Ruysch wrote little. Peter of Russia bought his unrivalled preparations for 30,000 florins; a second collection obtained a purchaser in the King of Poland for 20,000 florins.

§ Bidloo's fine plates were surreptitiously published as his own by our Cooper. He was Physician to William III.

|| Bauhin's plates are principally from Vesalius and Eustachius.

muscles; also Cowper, Cheselden,* the Monros, and the Hunters; whilst Harvey had already immortalised himself (1628) by the discovery of the circulation of the blood.

These great men were our masters in anatomy, and we should never forget that to their labours we are indebted for what we know. In human anatomy discovery is now nearly out of the question; its study consists in seeing what has been seen and described. Haller called the eighteenth century the era of its perfection.

In continuation of our plan, and as an introduction to the following chapters, we must take a brief survey of the different systems of organs, particularly connected with their functions, and we will commence with those of digestion or assimilation.

The anatomy and development of the teeth were investigated long ago by a master in anatomy, Eustachius, and since by John Hunter: and the former, with Fallopius, demonstrated the admirable muscular apparatus of the palate, pharynx, and gullet, by the combined action of which the food is swallowed, having been previously masticated and moistened by the secretions of the glandular apparatus of the mouth. These glands and their ducts were particularly demonstrated by Achillinus and Wharton. Valentin† gives a particular account of the movements of the œsophagus and stomach; the undulating contractions of the former in swallowing succeed each other rapidly, but the eye may follow them, as is familiar to us in the long neck of the horse; in man "each half of an undulation demands at least rather more than one-third of a second." The movements of the stomach are no doubt curious; we see in animals a result of them, in the hair-balls sometimes found there, polished and round externally, internally consisting

* Cheselden's work on the bones is dedicated to Queen Caroline, 1733. There are interesting engravings of some skeletons of animals in the volume.

† "Text Book of Physiology," by Dr. Brinton.

of hairs, which the animal has licked and swallowed. Galen and Vesalius pointed out many of the peculiarities of this organ, the former its muscular coat, as well as the mucous follicles, which last, however, have received their names in this organ, and in the intestinal canal from later anatomists, Brunner, Lieberkuhn, and Peyer. According to Bernard the gastric juice is secreted only in the pyloric third of the stomach. After the food is converted into chyme, the pylorus admits it into the small intestines, or progressively into the duodenum, jejunum, and ileon, and thence it passes into the cœcum, colon, and rectum, or large intestines, divisions distinguished by the ancients. The small intestines deliver their contents into the cœcum by the valve named after Bauhin, previously, however, described by Rondeletius. Achillinus and Beranger had also studied this curious portion of the intestinal canal, the latter seemingly viewing it as a second stomach. It is beautifully figured in Morgagni's plates. It is extremely large in some vegetable feeders, as rodents and solipeds. Disease, particularly obstruction from foreign matters, is apt to originate in this part or in the appendix. The villosities giving origin to the lacteals, the valvular duplicatures, the mucous follicles, and the muscular coat, arranged in the large bowels in longitudinal bands, also the processes and duplicatures of the peritoneal coat, often containing fat, were described by Vesalius and other early anatomists.

No doubt chylous or lacteal absorption takes place less from the large than the small intestine ; the absorption of aqueous fluids probably more freely. But after the chemical action produced in the food in the stomach by the gastric juice, the resulting chyme is mixed with the bile in the duodenum, also with the pancreatic juice, these secretions entering the bowel at the same point by the conjoined ducts of the liver and pancreas. These curious parts were known to Galen.* The result is the production of the chyle and and fæces from the chyme.

* The pancreatic duct, however, is said to have been first discovered in 1642, by a Bavarian anatomist.

In the present day Kiernan and Paget in this country have investigated the more minute structure of the liver. Animals which feed at long intervals have a reservoir of bile, or gall-bladder; those which are constantly eating have it not, at least such is the general rule. In the fasting or starving individual the gall-bladder is found full. With respect to that vascular and spongy body, the spleen, or rather with respect to its use, various conflicting opinions are and have been held, as indeed with regard to the liver, but rather as to details in its case. The spleen would appear, in the first place, to constitute a *diverticulum*, into which the blood-current is directed in particular states of the stomach or system. We found a human spleen, as taken from the body and emptied of the blood, to weigh six and a half ounces; when injected with water from its artery (the veins being tied) nearly sixteen ounces; this shows no great dilatability, however, but in some animals that property appears to be much more, and the organ is found engorged when the animal is killed in an enraged or excited state. Its coat is contractile when galvanised, as shown by Ecker. The enlargement of the organ in ague, apparently from the shivering, the departure of the blood from the external surface, and the internal congestion, favours this view, and that the spleen, as well as the liver, perhaps, may act as a provision of safety, or at least as a reservoir for the blood. Other anatomists, as Hewson and Bennett, have considered this viscus to be concerned in the formation or changes of the blood-corpuscles; it is supposed to be often enlarged or altered in cases of amenorrhœa, and in other diseases in which the blood is in a morbid state, and the microscope has seemed to strengthen this view. It varies as to number and position in different animals; in some of the cetacea there are several, and in these, as in the horse, its cells or receptacles of the blood are very apparent.* With respect to the

* See "Medical Times," 1852, No. 105, on the trabeculæ and blood-vessels of the spleen. Kölliker, Sanders, and Grey, have also investigated its structure.

pancreas, it is a sort of abdominal salivary gland, and it appears certain that when it is diseased, fatty matter is often ejected from the bowels, its office being, probably, to render that substance miscible, and fit to be taken into the circulating fluids.

But reserving this and other matters relating to the chemistry of digestion for the present, we merely observe that the chyme produced by the action of the gastric juice on the food, and afterwards changed into chyle, is absorbed from the *villi* of the intestines, in part by the veins going to the liver (the peculiarity of the vena porta being known to Beranger), and also by the lacteals. These last were described by Aselli, in 1621, the lymphatics afterwards by Rudbeck and Bartholinus, and the thoracic duct by Pecquet, in 1649, previously known, however, according to Portal, to Eustachius. Mascagni and our Cruikshank have been the great delineators of this system, whilst the structure of the glands situated upon these vessels, and supposed to be the elaborators of their fluid, was investigated by the wonderful skill of Ruysch and Malpighi.

The chyle and fluid from the lymphatics, the latter probably little different from the former, and nutrient in its quality, together with the venous blood, enter the heart by the two great ascending and descending veins; that portion of the blood which ascends from the digestive organs, having, as alluded to above, previously passed through the liver; the descending column having also received the contents of the thoracic duct, derived from the lacteals and lymphatics. The blood enters first the right reservoir of supply, the auricle, it is then forced into the right ventricle, unlike the auricle, exceedingly strong and muscular, and consequently by it the blood is expelled into the lungs by the pulmonary aorta. Between the auricle and ventricle, and between the ventricle and aorta are two sets of valves of different construction, and so beautifully adapted to prevent regurgitation as always to have excited the admiration of the anatomist, and to have led many to understand the course of the

blood through the heart before Harvey's time. In the lungs the blood is submitted to the action of the oxygen of the air which we breathe, absorbing it, and being decarbonised by giving out a nearly equal volume of carbonic acid gas, thence also becoming vermillion-coloured instead of modena-red. This operation must be accomplished through the pulmonary membrane by a species of endosmosis and exosmosis, not yet, however, as well investigated, as are the corresponding phenomena in two liquids, or two gases. Of the reality of this action there is no doubt, as it may be imitated out of the body. Returning from the lungs into the left auricle, and so into the strong left ventricle, and regurgitation being prevented as on the right side by similar curious valves, the blood is forced into all parts of the body, to nourish it, and generate animal heat; again to return, having lost its bright colour and excess of oxygen, by the veins, to the threshold of the heart, whence we set out. Much has been written as to the dynamic cause of the return of the blood by the veins. Parry's experiments would seem to show that these are quite passive agents, though many attribute muscular fibres to some of them; apparently the most efficient cause is a *vis-a-tergo* derived from the capillaries,* and perhaps connected with their nutritive action. This is aided by the beautiful valves of the veins,† and somewhat perhaps by the pulsation of the arteries which they commonly closely accompany, also by the general elasticity of the tissues, the action of the muscles, and the suctional power of the thorax and heart, as demonstrated by Barry. The power of the ventricles, aided by that of the arteries, is, at the least, great enough to account for the flow from the heart to the capillaries; but pulsation only occasionally extends to the veins in some cases of inflammation; and we see no pulsation in the capillaries under the microscope, though sometimes a

* From a similar cause the thoracic duct has burst when it has been tied on the living animal.

† In the lacteals and lymphatics the numerous valves must be principal agents in aiding the movement of the chyle and lymph.

sort of oscillation, as mentioned by Bichat. In the lower animals we, many years back, noticed that the vessels which circulate their fluids effect the same by means of parietal vibratile cilia.* We must, however, in the higher animals, set down the venous flow, principally to the *impetus* from the capillaries. With respect to absorption, Barry attributes it to the power of the suction above alluded to, and its attendant atmospheric pressure, and explains on the same views the efficacy of cupping in preventing the absorption of poisons from wounds and venomous bites. With respect to the arteries, it appears that the galvanising or stimulation of the nerves distributed to their coats, causes an increase of action in them, and, according to Soemmering, those of middle size are best supplied with nerves. We see nervous impressions evidently influence the circulation of parts; and the small vessels, when cut in operations, often spout out with a considerable force, apparently intrinsic.

The mechanism, or supposed mechanism, of the circulation early obtained the notice of philosophers; but before our Harvey it appears that no anatomist had a correct and complete knowledge of it. Nemesius, whom we translate from Portal, observes:—"The pulse commences at the heart, principally in the left ventricle of that viscus. The artery dilates and contracts with violence, and in a regular and harmonious manner. In dilatation it draws from the neighbouring veins the thickest portion of the blood, the exhalations from which serve to repair the vital spirits. In contraction it distributes over all the body, by unseen routes, all the exhalations which it contains, as the heart in expiration throws off all that is fuliginous either by the mouth or the nose." Here we may have, in obscure language, the distribution of the blood by the left ventricle to the body, and perhaps the return of the blood. The circulation through the lungs seems alluded to, but that through the liver is passed over in silence.

Servetus attributed animal heat to the circulation; was

* Report of the Trans. of the Brit. Assoc., 1839.

aware that the heart receives venous blood from the liver, that it is then passed through the lungs, gets to the left ventricle, and is distributed to the body by the arteries. He also gives reason for his belief in the circulation, observing that Galen was unacquainted with the important truth. He denies the old doctrine that the blood passes from the right to the left side of the heart through the *septum* of the ventricles, noticing the size of the pulmonary arteries, and that they proved the pulmonary circulation. With these truths, however, he appears to mix a doctrine of natural, animal, and vital spirit, and is not very intelligible on some points.*

Vesalius was probably acquainted with much of the circulation, but not with that of the portal system ; he noticed the effect of ligatures on vessels, one side being distended, the other empty. Galen understood the generation of animal heat as dependent on the circulation ; that the arteries contained blood and not air, a common idea with the early anatomists ; he knew too the vena porta, and the systole and diastole of the heart ; also the foramen ovale in the fœtal heart, that opening between the two sides to exclude the pulmonary tract from the circulation in a being not yet breathing. Columbus and others knew perfectly the valves and mechanism of the heart, and the course of the blood through the lungs (as did Servetus, from the ample size of the pulmonary artery), but not, apparently, the systemic circulation, nor that through the liver. Ruef's claims are exposed by Portal. Many, Cesalpinus for instance, thought there was a to-and-fro motion in the arteries. Fabricius, the master of Harvey, must have been instrumental in leading the way to the full discovery of this phenomenon, by his beautiful account and delineation of the valves of the veins. Of all these earlier anatomists, however, Servetus perhaps, is more particularly entitled to be mentioned with Harvey, and happier had he been had he confined his studies to anatomy, instead of embarking in what has been

* From Pettigrew and Portal's extracts from his rare work.

termed the anti-pacific ocean of controversy. Harvey seems himself alone entitled to the honour of being considered the discoverer, describer, and demonstrator of the circulation.* The labours of Willis, Senac, and Tiedemann, and of later anatomists, particularly those of our own country, have fully worked out this portion of anatomy, especially as relates to a practical knowledge of the blood-vessels.

There are a few glands or glandlike bodies—the thymus, thyroid, and super-renal capsules, ductless like the spleen, and respecting which there is the same obscurity of function. At present they are rather considered to be appendages of the absorbent system, and concerned in changes necessary to the formation of the blood. There are some peculiarities, as, for instance, the period of their greatest development, which may tend to throw light upon their nature. For instance, has the thymus any connexion with lactation, the thyroid any sympathy with the mammæ? Probably it is to comparative anatomy that we must look for a solution of these difficulties, particularly to the laws of development and principle of analogues.

But there are, besides the intestinal *rejectamenta,* other impurities to be thrown out, and that from the blood itself, for instance, superabundant salt, water, and that nitrogenous product derived from the waste of nerve, muscle, &c., or urea. This is accomplished by the kidneys, investigated by Galen and Eustachius, and minutely and satisfactorily studied by modern histologists, particularly by Mr. Bowman, as they were by Ruysch and Malpighi, by means of injection.

With respect to the brain and nerves, the medium of the impulse of the mind upon the body, and *vice versâ* of the body upon the mind—without which we could have no manifestation of feeling, thought, sensation, or motion—we must say, on the threshold of the subject, that though we are acquainted with this portion of anatomy, even to the

* Harvey's work was addressed to his Prince, Charles I., in a most courtly allegorical dedication.

minutest nerve, yet as regards the physiology and psychology, we are probably at the present time as we were at the commencement of the 17th century with respect to the circulation, at fault, waiting for some master-mind to elucidate the subject. Many of the parts of this system are still obscure in their meaning, though, no doubt, capable of being unravelled up to a certain point; the ultimate connexion of the spiritual with the material, of mind with brain and nerve, and the dynamic action of one upon the other, will probably remain for ever a mystery.

The anatomy of the brain was not unknown to Galen, nor to Herophilus and Erasistratus, whom he quotes. Cassius saw the decussation in front of the medulla oblongata. The anatomists of the *renaissance* were not inactive. Achillinus, Stephens, Vidus Vidius, Columbus, and Eustachius, for instance. Varolius, Arantius, Lieutaud, Willis, Vicq d'Azyr,* and the Monros, have been labourers in the same field.

Most of the cerebral nerves were known even to Galen, but the olfactory from their softness appear to have been often overlooked. Stephens demonstrated several; the distribution of the trigemini, the vagus, and the phrenic, as well as the sympathetic. Fallopius and the acute Eustachius investigated the difficult neurology at the base of the cranium. Fallopius is said to have confounded the seventh and fifth. The slender patheticus was known to Achillinus, and Columbus distinguished in the orbit the third from the ocular portion of the trigemini. All the nerves, thanks to the patient investigation of Willis, Vieussens and Walther, as well as more recent or even living anatomists, have now been well traced.

The organs of sense have always obtained the attention of the anatomist, particularly that beautiful dioptric instrument, the eye. Beranger knew the minute lachrymal points situated at the inner corner of the eye, and the lachrymal

* Vicq d'Azyr's large work, with coloured plates, is principally descriptive of the cephalic circulation. It was dedicated to Louis XVI.

apparatus generally. The Arabs understand this part of anatomy to the present day, as well as the diseases of the eye in general. The curious pulley of the upper oblique muscle was known to Rondeletius and Fallopius. Vesalius figures the crystalline lens as a sphere, and as occupying the centre of the eye. The membrane closing the pupil in the fœtus was discovered by Wachendorff, in 1740.

The ear is a complicated and curious organ, contained in its essential parts in a very small space. The semicircular canals and cochlea were known to the ancients; the little malleus and incus to Achillinus and Carpi, and the latter described the tympanum. The curious and minute bone, the stapes, was rather an important *bone of contention* between the three great men, Fallopius, Eustachius, and Ingrassias, who all met with it about the same time, as they were industriously unravelling the structure of this minute organ.

We pass over the skeleton and muscles; the names of Cheselden, Monro, and Albinus, of Clopton Havers, and Duverney, and of Fernel, Winslow, Bidloo, Cowper, and Douglas may be connected with the bones, the structure of the same, and the muscles. Columbus, in opposition to Fallopius, denied vehemently the existence of the pyramidales muscles, taking the exception for the rule.

Thus we believe we have shown that, with a very few exceptions, human anatomy has been thoroughly investigated, and is therefore competent to throw all possible light on the art of medicine.

Human anatomy and physiology have often been as much advanced by the study of that of the lower animals as by that of man himself; and this still remains an inexhaustible field of discovery, notwithstanding a host of inquirers—a Hunter and an Owen in England, a Blumenbach, Carus, and Meckel in Germany, and a St. Hilaire and Cuvier in France.

Again, during the last twenty years, the minute structure of organic beings has been submitted to closer observation by means of the superior instruments of the present day.

However, perhaps, too sanguine an expectation is often entertained with respect to the microscope. Though a powerful lens reveals the minute structure of an organ or tissue, yet it often brings us little nearer the comprehension of its physiology—sensation, contractility, secretion, nutrition, or absorption. Dr. Holland observes,—"After the most exact researches of late years, we do but partially comprehend those minute and complex mechanisms by which, in spaces barely accessible to the nicest instruments, the various functions of absorption, secretion and exudation, as well as the translation of blood from arteries to veins, are all simultaneously going on." Still, much interesting matter has been elicited by the histologists—the beautiful structure of the kidney, above alluded to, and that of the liver also; the tissues and vessels of plants; the structure of cartilage, bone, tooth, muscle, cilia, cellular membrane, fat, and skin in animals; also that of morbid growths, deposits, and degenerations; the microscopic character of the blood and other fluids, and the organization and characters of parasitical beings. It would be invidious to endeavour to call over the muster-roll of this band of observers.*

* Amongst foreign writers, Vogel, Wagner, Mandl, Donné, Kölliker, Gruby, and Robin, have published beautifully illustrated works on these subjects.

CHAPTER II.

A review of the nervous system, and the present state of our knowledge of it—Its anatomy and physiology as found in the different classes of invertebrate animals—The spinal cord, and encephalon in vertebrata and in man—The cerebral, spinal, and ganglionic nerves—The physiology of the nervous system—Pathology.

The nervous system is worthy of a lengthened consideration. Though its anatomy in man is well understood, yet we cannot say the same with regard to its functions, particularly as connected with the different parts. As yet no second Harvey has arisen to furnish us with the key to the

enigmas included in this part of our subject. It is, probably, to comparative anatomy that we must look for further light in this difficult inquiry.

Feeling, motion, digestion in a sac or stomach, and the evolution of young or ova, may exist in animals which have no apparent nervous system. We have in vain endeavoured to find one in the highly sensitive and contractile sea-anemone (Actinia), though Spix thought he did so. It is certainly difficult to perceive in the star-fish (Asterias), though Tiedemann is good authority for its presence there—disposed like the animal or starlike, with a ring around the mouth. (Pl. I. Fig. 1.)

When the organs of motion become more perfect, and sensation less diffused, there must be nerves and ganglia, the latter the seats of volition or motor impulse and perception ; the former the conductors of such impulse from, and of the sensation to, the ganglionic sensorium ; also to connect the actions of distant organs with each other.* But in the Ascaris (of the horse) (Fig. 2), the nervous system appears to be two distant parallel cords, with a few accessory filaments anteriorly, and, some say, a ring around the mouth. Siphunculas (Fig. 3), also an elongated animal, has only one long cord, with but slight appearance of ganglia upon it, giving branches anteriorly to the strong muscles of the proboscis, and others at regular intervals to the muscular integument.† The last leads to the sea-mouse (Aphrodite, Fig. 6), where we have a distinct sensorial ganglion above the mouth, encompassing the commencement

* In animals which have no nerves or ganglia to combine the movements of the different contractile parts, such as tentacles, &c., we have not the consentaneous and rapid contractions of higher animals, but rather such gradual and continuous movements as we see in the sensitive plant. However, in these lower animals, in their cilia, for instance, in the spinal pedicle of the Vorticella, or in the exertile arms of the Beroe, we sometimes see very rapid movements, but perhaps of a peculiar nature, and not dependent either on the muscular or nervous tissue.

† With such a nervous system as this, the movements, unlike those of the annelides, must be instantaneous.

of the digestive canal with a ring, which gives off visceral nerves, and meets below; a series of abdominal ganglia follow upon the continuation of the nerves, each pair, as well as the nerves themselves in this case, united into one, and the knotted cord, running below the alimentary canal with a ganglion to every segment of the body. There is some appearance of an upper and lower plane in this longitudinal cord, (Fig. 7).

Whilst the anatifer (Lepas), by its want of a concentrated supra-œsophageal ganglion connects the articulata with the lower mollusks, we have in the higher articulata, the crustacea, insects, and arachnida, a very perfect nervous system, on the same plan, however, as just mentioned. There is a distinct sympathetic, visceral, or branchio-visceral system, connected, however, with the first. The brain of the dragonfly (Libellula, Fig. 8) gives off large optic nerves, having reniform ganglia upon them to supply *fibrillæ* to the curious compound eyes; the inferior subœsophageal and maxillary ganglion is succeeded by large thoracic ganglia, supplying the legs and wings; the terminal abdominal ganglia in insects generally are large, supplying the caudal appendages. There are sometimes minute ganglia on the sympathetic nerves.

With respect to the double ganglia of these articulated animals, they must evidently form centres of sympathy between the two sides of the different segments, and their attached limbs or appendages, as well as between the segments themselves; also centres of impression and sources of power; they exist at the roots of the wings and legs of insects, of an increased size, and form one large centre or ring at the base of the legs of the crab. They are not exclusively connected with sensation, the horny segments of the lobster having them, whilst they are wanting in the soft tail of the hermit crab. They are centres of independent sensation and volition, or rather perhaps of motory impulse, determined by reflexed impression, as is seen in the divided animal. The movements of each segment are connected

with those of the next, and all, no doubt, placed under the control of the anterior ganglia by means of the longitudinal connecting cords.*

In the more irregularly formed mollusk there is a different disposition, the general rule being the presence of ganglia for the principal organs or systems; the existence of a ring of connexion, enormously wide in the lower bivalves around the mouth; a connexion of all the ganglia with the supra-œsophageal, sensorial, or labial ganglia; and the existence of another law, by which, as the animal rises in the scale, the different ganglia tend to concentrate and gather towards the head, to be, in the highest, shielded by a cartilaginous *cranium*. But this is probably rather a consequence of the growing importance of the head, than a real law, as sometimes laid down. The cephalic ganglia do not appear first in every case; the single respiratory ganglion of an Ascidia (Pl. II., Fig. 1,) is not analogous to the labial ganglion of a mussel, but it commands the function of respiration alone. Another so-called law appears to be that, in all animals the form and position and office of the nervous system has a relation to the general form of the body. Thus the existence of two symmetrical halves of the body would lead us to expect two symmetrical halves of the brain, which is the case.

Generally speaking, then, anterior ganglia, constituting a *sensorium*, are soon found in invertebrate animals, receiving nerves from the organs of sense, and directly or indirectly from all the other ganglia. The muscular or locomotive system, consisting commonly in the mollusk of a muscular foot or disc (Fig. 2), has also soon an appropriate double ganglion, but not existing in the oyster, as it has no organ of the sort. The nerves connecting these two upper and lower ganglia, or double ganglia, constitute the ring above alluded to. The respiratory system, or branchiæ, with their

* If we divide transversely an earthworm, the anterior half, having the cephalic ganglion, moves on as if nothing had happened, the posterior part writhes, but does not progress.

tubes, have another ganglion, consisting of two portions, perhaps not necessarily intimately connected together, at least in the higher mollusks, which is the case also with the locomotive ganglia, but always the reverse with the sensorial ganglia. It is probable that these ganglia are themselves, as far as their peculiar function is concerned, of an unmixed quality, sensitive, motor, respiratory or involuntary, though nerves of a different nature no doubt pass through each. This is sometimes evident to the eye. In the scallop (Pecten) the nerves which supply the numerous *ocelli* situated around the mantle, are derived, we think, from the respiratory ganglia, and if these *ocelli* are true visual organs, of which there appears no reason to doubt, there must be here an exception to the rule, that the optic nerves arise from the anterior sensorial ganglia.*

The above ganglia are not analogous to the ganglionic system of a vertebrate animal; we see them becoming more complicated as we ascend, till in the cuttle-fish (Sepia, Fig. 7), they constitute a nervous system, more perfect, though less regular than in many fishes. The ganglionic system of the viscera in the mollusk is distinct, and only connected with the sensorial ganglia indirectly, but rather with the respiratory ones, and with certain ganglia to be mentioned further on, situated upon the commencement of the alimentary canal, and perhaps analogous to the ganglia of the fifth pair in the vertebrata. Its centre in the higher mollusca is a certain ganglion or plexus situated near the stomach.

In the limpet (Patella, Fig. 4), amongst gasteropodes, the nervous system is analogous to that of bivalves, but all the ganglia have advanced towards the head, and the nerve which connects the branchial ganglia runs through the locomotive ones. The sensorial ganglia receive twigs from the eyes and tentacles, and give off little nerves, which form labial ganglia for the now developed mouth or *proboscis*, and

* The same respiratory ganglion supplies the shell muscle, but the action of this is intimately connected with respiration.

from these little branches go back to form the maxillary or masticatory ganglion for the strong manducatory apparatus,* exactly the same disposition as is seen in the cuttle-fish. Where the labial ganglia do not exist, the masticatory ganglia are connected directly with the sensorium. In the chitons the nervous system is more simple; the labial ganglia are wanting, from the simpler structure of the animal, and all the others are situated on the ring about the mouth.

In the spiral branchiated gasteropodes, Turbo and Janthina, we find the respiratory ganglia advanced to the sensorial, united in the latter, and sending down nerves to the branchiæ and viscera, having again a ganglion or ganglia in their course for those organs. A nerve is also given off on each side from the respiratory ganglion, to the mantle or respiratory sac (external respiratory) having a ganglion on one or both sides, and remarkably twisted according to the spiral disposition of the animal, and supplying particularly the muscular collar and sac pertaining to the respiratory organs. †

In these animals the ganglia, supplying the foot or muscular disc of locomotion, are connected with those supplying the branchiæ as well as with the sensorial. In Bullæa (Fig. 6) they are only united with each other through the sub-œsophageal cord, somewhat as in the limpet. The marsh-shell (Paludina) has the same disposition virtually as the limpet, *minus* the labial and maxillary ganglia, but the sensorial and respiratory are united together, whilst in Neritina it is the pedal and respiratory which are fused. In

* Few microscopic objects are more curious than the tessellated and spiny tongues of these animals, as of the chitons or fissurellæ.

† In all this, we perhaps see that the functions, particularly the respiratory, when they require the more complicated actions of more numerous parts, must have additional sources of nervous supply; but though such ganglia may be independent origins of the same, yet are they connected, as in higher animals with the encephalon, and especially with that part of it which is formed of the primitive respiratory ganglia.

all these animals the two sensorial ganglia are situated at a distance from each other.

In the naked marine gasteropodes the sensorial ganglia are united, more or less, into one cerebral mass, as in the sea-slug (Aplysia), as described by Cuvier, giving off the branches to the maxillary apparatus as usual. In the Doris (Fig. 3), Eolida, and Scyllæa, the three ganglia, central, pedal, and respiratory, are also more or less intimately united.† The ganglia, which in Aplysia are situated on each side the cerebral one, are connected together by two fillets, which would lead us to suppose each to consist of the mantle ganglion, and also of the pedal, but each gives three fillets to the sensorial ganglia, there being another ganglion at the posterior part of the body (branchio-visceral) which sends connecting nerves upwards.

In the whelk (Buccinum), common Helix (Fig. 5), and in the Natica, which appear to be among the highest gasteropodes, the brain consists of a diamond-shaped mass, situated below the intestinal canal, connected above by a broad band. From this upper band, branches are given as usual to the sensitive organs of the head and neck, the eyes, tentacles, penis, &c. Below, the main artery divides the mass into two parts, an anterior pedal or motor portion, and a posterior respiratory, the latter giving nerves to the organs of respiration and the mantle, with ganglia often upon the two external twisted nerves, and one in the course of the branchio-visceral nerves, giving filaments to the heart, branchiæ, stomach and blood-vessels. The maxillary ganglia are derived from twigs arising apparently intermediately between the sensitive and moter part of the band.†

The cephalopoda, the cuttle-fish (Sepia), for instance, have a more complicated nervous system (Figs. 7 and 8) than the

* In some of these eyeless gasteropodes, the trace of pigmentum nigrum may be seen in a black spot on the brain itself.

† Perhaps the most interesting part here is the evidently growing analogy and resemblance to the same system in the cephalopoda—it is plain there is unity of formation even here.

last, but on the same plan. The sepia has a distinct head, crowned with prehensile and locomotive arms, large eyes, a complicated valvular respiratory sac, and lateral fins situated on this sac, by which it beautifully progresses ; also a cartilaginous skeleton, besides its shell, and highly developed viscera. The nervous system is still, however, as to its centre, a ring around the œsophagus, having a cerebral lobe developed at its upper or dorsal part, an evident sensorium, giving origin to optic and acoustic nerves. Anteriorly from the lower or ventral portion, the nerves of the arms or feet arise, from the back part the branchio-visceral, and the two large nerves supplying the mantle, and muscular branches supplying parts concerned in respiration. In the course of the two nerves of the mantle occur two large ganglia, but they belong only to the portion of the nerve which supplies the respiratory sac, not the fins. The ganglia must be independent sources of motion and sensation, cutting off to some extent the contractions of the saccular mantle from the influence of the *sensorium,* insuring its contractions in a consentaneous manner, and placing it in sympathy with the nerves of the respiratory and sympathetic system with which they inosculate. The fins being voluntary in their action are more directly connected with the brain. The siphons and valvular apparatus derive nerves from the lower part of the encephalon, and appear to be brought in unison with the ganglia of the respiratory sac by the twigs which arise from the latter and go to the brain. In front of the *sensorium* is a labial ganglion (olfactory in the Nautilus, Owen). This has nerves on each side from near the origin of the optic (olfactory), also upper roots (sensorial), and lower (motor) ; in front this ganglion gives nerves to form the maxillary ganglion, distributed, as usual, to the muscles, moving the horny jaws or beak, and also giving origin to the sympathetic, which is also connected with the branchio-visceral nerves, and with a large ganglion upon the stomach. The branchial nerves have also ganglia at the base of the gills. The nerves of the feet, like the labial

ganglia, have sensorial and motor roots. There are also very large ganglia on the optic nerves, before they enter the orbits. The brain then may be said to consist principally of a sensitive, motor, and respiratory portion, the two latter being separated by the aorta, as is the case in the higher gasteropodes.

The remaining classes of animals, vertebrata, or, as they have been termed, cerebro-spinal, are all constructed in a remarkable manner upon the same plan, though in the details that plan is varied *ad infinitum.* If in these animals we, at first, apparently, discover in any species any new part or organ, we shall in others, with a little research, find a trace of the same or its *analogue,* a law which was noticed by no less a man than Sir I. Newton, and which holds good even in those wanton sports of nature called monstrosities. In all these animals we have a spinal cord, protected in a strong yet flexible bony tube, being itself a centre of sensation and motor power, perhaps the principal one in fishes and reptiles; its upper portion, the medulla oblongata, being, however, more especially so, as well as the centre of the respiratory and circulatory functions. Above, enclosed in the cranium, formed in reality by highly developed and expanded vertebræ, is a brain, consisting of various parts, but its two principal divisions, at least in the higher vertebrata, being the cerebrum and cerebellum, the centres doubtless in them of intellect, emotion, perception, and volition.

In a very large cod the brain (Pl. III.) is no broader than the little finger, having above, in front, two rather corrugated grey tubercles (hemispheres), next two other larger ones (optic lobes), and lastly a tongue-like body of white and grey matter directed backwards (cerebellum). No doubt many of the actions of these animals proceed from sensations received and motions determined by parts below the cerebral and optic lobes, as they may be taken away, and yet the animal will live and move, but dislocate a fish's neck, or crush the medulla oblongata, and it very soon dies. The same rule applies to the frog, which will leap after the brain

is removed. The olfactory nerves are in part inserted into these anterior lobes, but with another root further backwards, which may carry impressions to the automatic source of motion—the medulla. The cerebral lobes may also possibly receive other impressions from below through their small crura, and cause corresponding movements through the same, though the medulla is probably the principal centre of them in all the lower vertebrata. The optic lobes are probably the channel through which, on the one hand, sensations pass downwards and backwards to the respiratory and automatic centres, rendering sight, smell, &c., subservient to these functions, and the reverse, particularly in higher animals, upwards and forwards, rendering hearing, taste, &c., attendants on the mind. A decussation of the posterior tracts also probably takes place here.* We conclude the cerebellum to be the centre to which is referred muscular sensation, and by which the movements are placed in co-ordination, and those originated, which are carried on by the so-called voluntary muscles when our attention is not directed to them. It is more perfect in the skate than in the cod, and the movements of the former are more complicated, and not aided by an air-bladder; it is also developed

* Swan. Much of the knowledge which we might wish of the cerebral functions appears to hinge upon a further insight into the meaning of these optic lobes, or corpora quadrigemina, as they are called in the mammalia, consisting in the latter of four rounded eminences. The following appear to be pretty certain *data*—they are generally developed in proportion to the perfection of the eyes, but yet not quite exclusively so, as the upper ones exist in the mole (Pl. V., Figs. 5 and 7), which has these organs quite rudimentary—they have apparently no particular connexion with the olfactory nerves, as the dolphin, which has not the latter, has the former much developed—being situated where the principal portions of the anterior and posterior columns of the cord diverge as it were, they appear particularly connected with the middle, involuntary, or respiratory tract; in the highest mammalia the optic nerves are less connected with them than with the thalami, but this is reversed in the lower; they are relatively larger as we descend, and therefore their function must become relatively more important; in the mammalia the anterior or posterior tubercles may preponderate in size, but at present the rationale of this variation seems doubtful.

in the active shark.* One of the most remarkable parts of the brain of the cod, as well as of other fishes, but differing much in disposition, is a sort of tuber cinereum, of a very large size, situated at its lower part, apparently developed in proportion to the development of the optic nerve, and perhaps uniting it in sympathy with the roots of the motor nerves of the eye, almost equally developed in the cod as in man ; also, we believe, in all vertebrata forming the junction between the optic nerves and spinal cord. The spinal cord with its central canal, which communicates with the fourth ventricle, is in most fishes continuous to the tail, and the spinal nerves originate, as in all vertebrate animals, by double roots, without ganglia however, and the nerves destined for the front and back muscles are produced by an interlacement of both the anterior and posterior roots, the successive nerves also communicating.† A remarkable nerve (a branch of the fifth, according to Desmoulins) leaves the cranium above, and is distributed to the oper-

* M. Desmoulins, however, argues against this view, principally from certain experiments of M. Majendie, and also, and we think erroneously, because injury of the cerebellum appears to have little effect on the (mere instinctive) movements. The experiments alluded to would seem to prove that the cerebellum originates those muscular efforts by which the animal is impelled forwards, and that it is antagonistic to the striated bodies which produce the reverse tendency. The lateral lobes, and the pons which they form, do not exist in birds, and the latter is certainly small in bats: both having a combined and simultaneous motion of the anterior extremities, might lead us to suspect that separation and not combination of muscular action is the function of these lobes.

† Bellingieri's views of an arrangement existing in the spinal cord to separately supply the flexors and extensors of the body, are considered by some to be in accordance with certain phenomena seen in disease, in convulsions, tetanus, and muscular contractions. The above arrangement in fishes seems to throw no light on the subject, but only to be a plan for the simultaneous action of great masses of muscle. The doctrine of an anterior, motor, and posterior, sensorial column in the spinal cord is fully established, but in addition there must be some connexion near their origin between the nerves, as flexors and extensors, and this is probably in the spinal cord.

culum, fins, and sides of the body, anastomising with two branches of the eighth, and particularly with the spinal nerves. The viscera are supplied by a sympathetic nerve, having ganglia and plexuses upon it, and connected with the cranial, respiratory, and spinal nerves.

We have already observed that a law of the nervous system is a degree of correspondence in form with that of the animal; it is this which principally causes the difference between the nervous system of a fish and the sepia. Were the brain of the former to be threaded as it were by the œsophagus about the pituitary body, the third ventricle, and below the optic lobes, there would be little or no difference in the nature and situation of the ganglionic enlargements. In some fishes a spinal cord is nearly absent, as in the frog-fish (Lophius), or moon-fish (Tetrodon). It retains marks of its original formation from lateral bands, in its dorsal groove, central canal, and ventricle above. Near this ventricle the fifth and eighth nerves arise, and it has in some fishes, as the carp, a lobe or set of tubercles on its floor appertaining to these; there is also a remarkable lobe in the torpedo; and both are attended with peculiar endowments in the animal.

The internal anatomy of the optic lobes and their connexion with the cerebellum, optic nerves, and spinal columns, have been described by Arsaky and Desmoulins. We figure the parts as seen in the cod (Pl III., Figs. 2, 3, 4); they are white without, with grey matter within, the reverse of the cerebellum.

The grey olfactory lobes, seen in the cod at the end of the long olfactory nerves, which arise in double roots from the cerebral lobes and anterior commissure or crura, are, in the rays or sharks, united into one large body with the cerebral lobes, and in some of the latter this part is very like a brain, and has ventricles which extend into the olfactory nerves. The cod has a very curious and perfect internal ear and acoustic nerves; its three sets of cerebral ganglia may be considered in one sense as olfactory, optic, and acoustic

or tactic, the fifth, as well as the seventh and eighth, nerves seeming to originate from near the cerebellum. The food of the animal appears to be principally crabs, and other crustacea and probably taste and bodily touch are deficient to a great extent.

The frog (Pl. IV., Figs. 1, 2), at one stage of its existence a fish or tadpole, presents us with almost all the nerves of a mammalian animal, yet, in its encephalon, it is not far removed from the fish. The spinal cord is, however, much developed, extending behind in a tapering way to the extremity of the body, but large in front, with a capacious ventricle which is open above, but filled with a peculiar spongy and vascular portion of the membranes. There is no proper cerebellum, but some appearance of thalami, corpora striata, ventricles, commissures, and pituitary body. This nervous system is varied in the other orders of reptiles.

The crocodile has the cerebellum more developed, and olfactory lobes, which are, however, often absent in its order, also the spinal cord larger in the part where the nerves of the limbs are given off, whilst in serpents the latter is of uniform diameter, with an internal cavity. In serpents the pineal gland appears absent, but certainly not in the tortoise (Fig. 3), the brain of which is well figured by Bojanus. In reptiles generally there appears to be increased development of the cerebral hemispheres, the organs of sense small, as well as their nerves, the optic lobes also small, and the absence or little development of the cerebellum, corresponding with the limited locomotion of the animal. The frog would appear to be an exception to the last observation, its movements being very vivacious; they are, however, rather simple and uniform in their nature, and its spinal cord is much developed, evidently the source of this activity, the muscles also possessing great inherent contractility.*

In birds (Pl. IV., Figs. 6, 7, 8, 9, 10, 11) the cerebrum is

* The spinal cord is evidently the principal portion of the nervous system of the frog, the animal moving well, and even seeing when the brain is removed. In the slow-moving toad it is only about half the length.

much amplified, but it continues smooth on its surface, and without the corpus callosum. The ventricles appear to have a septum lucidum, which is formed by fibres radiating from near the anterior commissure, as in mammalia; the hemispheres themselves are evidently formed by fibres rising from the spinal cord and radiating in them. Those from the anterior part of the spinal cord are seen to ascend, some above and some under the anterior commissure, to the hemispheres, those to be seen in the floor of the fourth ventricle to the small thalami. With these thalami there is a third ventricle as well as lateral ones, commissures, pineal gland, plexus choroides, and fornix. The olfactory nerves apparently can often be traced to a considerable distance along the inferior surface of the hemispheres; and the optic lobes, to which the optic nerves undoubtedly go, have a remarkable position at the lower part of the brain, but united by a commissure above. They are much developed like the optic nerve itself. Below this commissure the fourth nerve arises, and both nerves are united in the centre, and scarcely attached to the brain at all: the optic lobes themselves are hollow; the cerebellum is large and has transverse folds, but neither side lobes, nor what attends them, a pons, forming their commissure; it has a cavity in its interior, and consists, in fact, of the middle lobe of higher animals. The spinal cord presents a remarkable dilatation or ventricle where the nerves of the inferior extremities originate; the spinal nerves have double roots and also ganglia.

The nervous system consists in the mammalia, and in the highest of them, man, of the nerves going to or coming from the spinal cord, the spinal cord itself, the medulla oblongata, or capital, as it were, of the cord or column, situated at the base of the skull, whilst the cord is enclosed in the vertebral canal, and the brain, divided into a large upper and anterior mass, the cerebrum, and a posterior and lower one, the cerebellum or lesser brain; also the cerebral and ganglionic nerves.

The encephalon is certainly the *sensorium* to which the

sensations of the organs, smell, sight, hearing, taste, general sensation, the muscular sense, the respiratory want, with hunger, thirst, and the generative feeling, are ultimately, and especially in man, referred by means of nerves, called nerves of sensation or afferent.

From the encephalon go to the muscles other nerves, called nerves of motion or efferent, and these with the nerves of sensation, with which they are commonly united, are distributed through the spinal cord in a ramified manner to the different parts of the body.*

From injury of the spinal cord, or of a large nerve, it is proved that sensation and motion are destroyed in all parts below the injury, the medium of communication being destroyed. Some nerves may be called internuncial, uniting different parts or organs as media of sympathy.

Paralysed limbs are, however, sometimes seen to move, when pricked or pinched, without the *sensorium* being conscious of it; this would show that the nerves of sensation and motion have some connexion below the brain in the spinal marrow. This so-called reflex action is well seen by dividing a frog in the middle, and irritating or scratching one foot, the anus, or even the intestine, when it will be observed that both legs will contract, though the cerebral sensorium is removed; but if a leg alone is cut off, and the foot irritated, it will not contract. There may evidently be reflex sensation as well as motion produced by any irritation, and also secretion, as is seen in the flow of tears from irritating the nose or eye, or of saliva when sapid substances are applied to the tongue. Reflex pains occur with respect to the liver and shoulder muscles, the bladder and glans penis, the heart and the arm, the hip and knee joint, the mammæ and genitals, the forehead and stomach, &c.† We see reflex action also in sneezing, in tickling producing

* It appears pretty plain that the spinal nerves are partly continued upwards in the cord through the white fibrous matter, in part originate or terminate in the interior grey matter.

† Dr. Carpenter.

laughter, in closure of the eyelids from a particle in the eye, or in coughing when we touch the larynx. The experiment on the frog proves that the spinal cord is a source of power, as well as a conductor of it.

A kitten will suck when the brain is removed, and in Dr. Parry's Posthumous Works we have the account of an acephalous infant with no brain or nerve at all in the cranium, and the medulla oblongata existing only as high as the sulcus above the corpora pyramidalia, and yet respiration was carried on for twenty-four hours; it also swallowed food, and sucked the finger, and raised its feet when tickled. Such phenomena are evidently something more than the contraction (*vis insita*) which a muscle undergoes when irritated itself, as we may see sometimes in an amputated limb, or through its nerve, as in an experiment in animal electricity, much more than any other species of contraction or tonicity, such as is seen in the functions of organic life, or the *rigor mortis.* This motion through the medium of the spinal cord, often observed before, especially by Legallois, has been more clearly expounded by Dr. M. Hall. Probably the lower we descend in the scale of creation, the less does contractility depend upon the nervous centres, and the more diffused the nervous power. A portion of a mollusk entirely severed from any ganglia will strongly contract when pricked.

In the different ganglia of the body, at least those with medullary matter, and which are not mere interlacements of fibres, there is an increased, or, in some cases, independent source of nervous power, neither are they necessarily connected with sensitive nerves, as Bell supposed, and there must also be in some cases, as indeed has been maintained, a cutting off of general nervous action in them, and also a reflexion of the same. This is evident when we consider their functions, as, for instance, those of the ciliary, submaxillary, sublingual, or semilunar ganglia. The fibrous ganglia, like plexuses, must combine, distribute, or separate nervous power.

How a muscle contracts under the nervous influence,

neither minute anatomy nor the microscope has at present shown. But if we might suppose the existence of a nervous principle, analogous to that of electricity, conveyed by the nerve and generated in the brain, in which last indeed we see two structures, which are by their peculiar homogeneous nature and alternate disposition in layers of grey and white matter, more analogous to a galvanic arrangement than to any other kind of organization ; if this might be supposed it would be easy to demonstrate that a disposition of the muscular fibres in various ways might lead to their contraction. In fact the simple and evident microscopical structure of striped muscle appears to be such as would be likely to cause that phenomenon.* The phenomenon of reflex action shows that the nervous power is not solely generated in the brain.

Does muscular contraction (as distinct from mere tonicity) depend upon some influence of the nerve, or in reality upon the endowment of the muscle itself (the *vis insita*), the nerves simply rendering this contractility subject to a distant influence? There appear to be several considerations, and particularly the continued irritability of muscles, when the nervous power is cut off, to make us conclude that the last is the correct view; yet we see no muscles, at least with the exception of the lowest animals, without nerves either of animal or organic life; the analogy of vegetable contractility may be disputed; and in cases when we irritate the nerves of organic life without effect on the muscles, the independence of the latter may be denied, on the ground that our *stimulus* is not the natural one. If irritability is derived from the nerves, it must in many cases be from them exclusively, and not from the nervous centre.†

It now appears certain, notwithstanding various objections

* The zigzags seen in the fibrillæ under the microscope "only form the expression of a contest in which elasticity overcomes the remaining traces of contractility." Valentin's "Text Book," by Dr. Brinton.

† Pure sensations, as of heat or cold, also, appear to be peculiar to the extremities of the nerves, or rather to the tissues.

and pseudo-experiments, and we are indebted to Sir C. Bell for the discovery and demonstration, that the posterior columns of the spinal cord convey sensation up to the encephalon, and that the anterior columns are the conveyers of the motor force down from it. The nerves have generally two roots from these columns, anterior and posterior, or motor and sensitive. The above fact appears evident, not only from Sir C. Bell's experiments, confirmed by others, but also from anatomy and pathology—for instance, along the motor tract the third, sixth, and ninth nerves arise, all evidently motor, whilst the nerves of sensation have as plain a tendency towards the posterior, or sensitive tract.

As hinted before, the functions of organic life, digestion, circulation, secretion, absorption, &c., are presided over by a separate nervous system, the ganglionic, only slightly connected with the brain, and therefore such functions are mostly independent of our will.* These nerves commonly follow the course of the arteries and are distributed to the viscera. The action of the bowels, liver, gall-bladder, and kidneys, seem more or less removed from the control of the will, and cerebro-spinal system, and, together with the building up and taking down of the structure of the body, are presided over by these nerves.† There is no doubt that artificial irritation of the ganglionic nerves affects the corresponding viscera, though not so instantaneously as in cases of voluntary muscles ; in the intestines this irritation only favours undulations, which is what might be expected. The heart will beat when out of the body, but it is questionable whether the existence of its nerves is not a *sine quâ non* for its continued and combined action. Stimula-

* Dr. Carpenter and others, however, are disposed to doubt Bichat's views of the functions of this system as given above, but we think without sufficient grounds.

† The spinal cord, however, has *in toto* an influence on the great parts of organic life. It may in one of the lower animals be cut across in any portion of its course without much affecting the heart, but if a probe is run down the vertebral canal, destroying the medulla, the effect is very decided.

tion of the vagus stops the heart's action, that of the ganglionic system accelerates it, and a curious circumstance relating to this organ is, that, although its action is so remarkably independent of the will, it is yet very easily affected by emotions; and it has been observed by Dr. Holland, that in some cases in which it is generally irregular in its action it becomes regular after an attack of paralysis, showing how the cerebro-spinal system affects it. But other organs still more involuntary in their action are so affected, as the capillaries in blushing, the salivary glands, the mammæ, &c. The cause of the peculiar and wonderful rhythmical contraction of the heart we must in our ignorance refer to its original endowment—as a final cause. Other muscles, however, may show something of the sort, under particular circumstances, and we feel in our own nerves, after pressure, &c., a sort of rhythmical increase and decrease of sensation. It is perhaps an undecided point what influence is conveyed by the nerves forming the communications between the ganglionic and cerebro-spinal systems—they are probably means of sympathy, and may also convey nervous, at least motor power, from the latter to the former, and sensation, particularly in disease, *vice versâ*. In the eye we see the iris, subject to an involuntary movement, sympathizing with the state of the second or optic nerve; this movement is governed by a ganglion, connected more particularly with the motor nerves of the eye; and though the sympathy of the iris and optic nerve is explicable from the existence of the minute communicating ciliary or iridian twigs, it has at the same time been observed, that when the motor nerves (third) and the muscles of the eye are paralysed, the iris also is inactive. This part then, though governed by its own ganglion, is not independent of the cerebro-spinal system, less so than the heart, although it is as little under the control of the will, at least in man.*

* In birds the motion of the iris is quite voluntary, the iridian nerve (branch of third) of an eagle is very large. Lesion of the ganglionic system in the neck affects the iris in the dog, and a lenticular ganglion or

The fifth nerve connects the ganglion with the general sympathetic system.

According to Dr. Carpenter, animal movements may be produced by the cerebrum as the seat of the will; by its emotional and ideal action without volition; by the ganglia at its base, whichever they are, the centre of sensori-motor reflexion; and by the spinal cord, the centre of excito-motor reflexion; impression produces the last, sensations the preceding, ideas and emotions the second, and the latter, through the intellectual operations, influence the will. Over many of the more animal and involuntary reflex motions we have still a partial and occasional control.

The brain and spinal cord, as observed above, are composed of two lateral halves, and an appearance of a crossing over or decussation of the fibres in the anterior columns at the upper extremity of the cord, has been long known. When the motor power is paralysed, and the cause is an injury or disease of the brain, the paralysis and lesion in the head are situated in opposite sides.* Sensation, too, is equally affected, but there is no posterior decussation at the same spot, though it was maintained by Bell in opposition to Mayo. Mr. Swan believes such to take place in the sensitive cords in the corpora quadrigemina. The fifth nerve is analogously affected in paralysis.

At the upper extremity of the cord, and between the anterior and posterior columns, the olivary prominences, especially in man, mark a tract extending upwards and downwards to an uncertain length, but of which, as being a respiratory tract (involuntary, according to some), we can scarcely doubt, as it gives origin to the great respiratory nerves. It is very likely that the olivary body itself particularly appertains to the origin of these nerves, and as it

proper source of nervous supply scarcely exists at all in that animal. The connexion of the lenticular ganglion with the fifth accounts for the action of belladonna when rubbed about the eye.

* Physiologists, however, are divided as to this decussation being the real circumstance disposing to the crossed phenomena in question.

is large in man some have supposed it to be related to the faculty of speech in particular.

The anterior and upper and larger portion of the brain, the cerebrum, or brain proper, occupies the whole of the cranial vault, except a portion of the lower and back occipital region, which is occupied by the cerebellum, and in some animals, as the fox, a curious lamina of bone separates them. The cerebellum is a bilobed body in man, much lamellated externally, and beautifully arborescent, with a mixture of grey and white matter within. Its middle part appears to be a distinct portion, but is confluent with the lateral lobes, and is formed more particularly by the bands descending by the valve of Vieussens from the cerebrum and corpora quadrigemina. The lobes are formed by the posterior columns of the spinal cord or restiform bodies, with (some say) accessory fibres from the other columns ; the lobes give off, on each side, another great band, which with its fellow envelopes the medulla in front, and forms the pons Varolii. This pons does not exist except in mammalia, and in many of them it is more or less deficient behind, being developed in proportion to the lobes of the cerebellum which form it.

The cerebrum is also composed of external, cortical, cineritious, or grey—and internal, medullary, or white matter of a fibrous structure. The former is shown by the microscope to be formed of vesicles or cells filled with granular matter, nucleated and curiously stellate or branched, and very vascular. The ganglia of mollusks are often of a dark colour, as may be seen in a common mussel. The external eminences of the cerebrum are arranged in a different manner from those of the cerebellum ; they are in man semilobular, more or less elongated, and gyrose and branched, so as to be called convolutions, often extending, particularly on the upper surface, to a considerable depth, or rather the *sulci* between them. The cerebrum is nearly of the shape of the longitudinal half of a short or roundish egg, and narrowest anteriorly, the flat surface being below, and overhanging the cerebellum behind. It is covered with convolutions here as well as above, and it is longitudinally divided

by a fissure, in which we also see convolutions. The medulla oblongata enters it obliquely from behind, and below, and towards the centre, like a pedicle, having been previously covered by the pons, and of course here is the connexion between cerebrum and cerebellum. The cerebrum is not however exactly flat below, as about the middle on each side is a remarkable prominence, the middle lobe, resting on the fossa at the base of the skull, the anterior lobe resting on the orbit, and the posterior one on the cerebellum.

The anterior lobes are narrowest in the most stupid animals, as the kangaroo, agouti, hyrax, and coati; wider in the beaver, seal, dolphin, and such mammalia as are supposed to show most understanding. The cat, however (Pl. VI., Fig. 3), like the feline race generally, has a broader brain in front than the dog (Fig. 1), yet it is from the cutting off of some of the convolutions. These lobes are also smaller in the sheep (Pl. VII., Fig. 3) or stag than in the camel, an animal of the same order, but more docile than the former. The middle lobe is large in most animals, even low in the scale, and therefore the animal propensities should be localized there. The posterior lobe is peculiar to handed animals, man, and the higher quadrumana, and we must therefore suppose it to have higher functions than the phrenologists are disposed to give it.

The perfection of the brain has been set down as capable of being measured by the size of the convolutions. All small animals however, to whatever class they belong, the musk deer of Java amongst ruminants, and the hyrax amongst pachydermata, for instance, have smooth brains. The same is the case with rodents and birds, which are by no means deficient in intelligence. The agouti, sloth, porcupine, hare (Pl. V., Fig. 2), beaver, squirrel (Fig. 4), bat (Fig. 8), mole (Fig. 5), and hedgehog (Fig. 12), have smooth brains. The sheep (Pl. VII., Fig. 3), cow, and horse (Fig. 4), have numerous convolutions. Apparently mechanical considerations as to safety during violent exercise, packing, size, &c., influence the number of convolutions. According to Swan, animals of short continued but violent excitability,

as the lion, have few and large convolutions; those of quieter habits, but long continued activity, as the horse, have them small and numerous. Of the fact there is no doubt, whatever we may think of the reason given for it.*

The formation of the cerebrum by the columns of fibres from the medulla oblongata, six in number, three on each side, voluntary or motor, involuntary or respiratory, and sensitive, is an important point in anatomy, yet in the details of it there is some difference of opinion. Mr. Swan's views are the most recent, and, in the main, strengthen the opinion propounded by Bell, and now generally adopted. He makes the anterior or motor columns to expand into the cerebrum, as generally admitted; the lateral and respiratory also to ascend up to it and form convolutions near the summit on each side; and the posterior or sensitive, with the posterior corpora pyramidalia, a part (of course) going to form the cerebellum, also to attain the cerebrum posteriorly. The anterior columns (pyramidal bodies and voluntary or motor tracts) form the crura of the brain, spread out beneath the surface of the striated body, are combined with the commissure or corpus callosum, and form the convolutions of the anterior and median sides of the hemispheres; other bands of the crura form the convolutions of the inner and inferior portion of the anterior lobe, and the island of Reil situated in the fissure of Sylvius, also the outer part of the great commissure, and the outer, and upper, and anterior surface of the hemispheres, the convolutions of the middle lobes also, and the inner and outer ones of the posterior lobes. Part of the above fibres are first inserted into the white partition between "the internal and external oval receptacles" of the convolutions, which separates the island of Reil from the corpus striatum, and from these receptacles is prolonged backwards a caudi-

* Probably the size and course of the cerebral blood-vessels much influence the number and disposition of the couvolutions, as the sulci appear to be for their lodgment: the minute vessels of small animals require no sulci.

form process, from which the convolutions of the middle and posterior lobes principally arise.

The sensitive tract passes along the floor of the fourth ventricle, forms the valve of Vieussens, and goes through the corpora quadrigemina, forming a thick cord and a sort of ganglion just before the geniculate bodies, and then passing across the thalamus and under the optic tracts. It expands and radiates underneath the lining of the ventricle, forms convolutions on the outer side of the summit of the brain and those bordering on the inferior horn, and its fibres are connected with the optic and olfactory tracts.

The middle or involuntary tract goes upwards by the *iter a tertio ad quartum ventriculum* to the inner side of the thalamus, passes through a sort of ring, crosses the thalamus and the narrow end of the corpus striatum, and forms, as observed before, a convolution of the upper and posterior part of the middle lobe. The fifth nerve has an origin from this column.

Though this simple disposition of the columns of the medulla oblongata, as described by Swan, seems pretty consonant both with the plain anatomical appearance, and also with the physiology which is connected with the part; yet there are certainly some accessory tracts and bundles of fibres not described, with some other supposed ones, the existence of which rests on the opinion only of other anatomists. According to some, the restiform roots of the cerebellum, the formation of which organ is quite passed over by Swan, have not only fibres from the lateral, but also a few from the anterior columns. The little posterior pyramids pass up to the cerebrum, with the fasciculi teretes seen on the floor of the fourth ventricle, the latter being formed by the lateral columns. There seems no reason to deny these last facts.

The lateral columns, or at least the deep matter of the cord, comes forward, on the middle line in front, between the pyramids, and forms the decussation there visible, also seeming to form the anterior pyramids themselves. The anterior pyramids are often considered as distinct from the anterior columns.

Some anatomists consider the anterior columns, after embracing the olivary tubercles, to pass upwards as the "fillets" to the corpora quadrigemina, and thence to the back part of the hemispheres; it is questionable whether these should not be given, as they are by other anatomists, to the lateral columns.

With respect to the cerebellum, its spinal roots appear to be distributed to its upper surface; the pons receives the crura from the lower, whilst a band descends from the corpora quadrigemina and valve of Vieussens on each side, to form its middle vermiform process. The little lobule on each side appears to us to give origin to the delicate inferior valve of the fourth ventricle.

The anterior part of the cerebral crura (crust) is derived from the anterior columns on each side, the posterior (tegmentum) from the lateral fasciculi teretes, posterior pyramids, and the bands from the cerebellum. The anterior part of each crus passes entirely through the corpus striatum to the hemispheres, the posterior through the thalamus also, in part or wholly.

But Foville supposes the crust of the crura to be principally concerned in the formation of the convolutions on the convex surface of the brain, the outer half of the marginal convolution of the longitudinal fissure, and the inner half of that of the Sylvian fissure, whilst the tegmentum, passing through the thalamus, forms the corpus callosum (which is therefore not a commissure of the radiations but of the crura), and also part of its fibres, running forwards beneath the brain, attain the perforated space, the tegmentum also forms the longitudinal fibres of the tænia, corpus callosum, fornix, gyrus fornicatus, &c.

We shall not notice the opinions of others, as Turck, Arnold, and Mayo, upon this difficult point of anatomy. Desmoulins explains the origin of the toothed nuclei within the olivary bodies, and the posterior crura of the cerebellum by the original formation of the parts from duplicatures of the pia mater.

We believe there is some evidence to suppose that the nature of the corpora quadrigemina is partly that of ganglia to the respiratory nerves. They do not exclusively belong to the optic nerves, for we find them existing of a tolerable size in animals, which cannot be said to have those nerves. Tiedemann attributes their formation principally to the olivary or middle respiratory fasciculi, as did Reil,* and this appears to be the fact. Serres attributes similar power to them which we give to the cerebellum, but we believe without good grounds. When we see also the anterior columns proceeding up to the brain, whilst the posterior are given principally to the cerebellum, we conclude that the middle columns are here left at the divergence, and have these tubercles formed upon them, enveloped, however, by the fibres which ascend from the cerebellum to the cerebrum, and by the insertion of the optic nerves, which, however in man, as observed before, are principally inserted into the thalami and geniculate bodies, conveying their sensations to the mind rather than to the respiratory or involuntary, or motor *foci*, which they appear to do (principally) in the lower vertebrata. We have already mentioned the peculiar position of the optic lobes in birds.

It appears that the motor fibres or crust, or fasciculated part of the crus cerebri, principally forms the corpora striata,† the scythe-shaped grey bodies seen on the floors of the lateral ventricle, and are less connected with those oval bodies called thalami optici, the upper surfaces of which are seen in the same cavities, and appertain to the other columns, to sensation, and to the tegmentum or posterior part of the crus. The corpus callosum, situated in the fissure between the hemispheres, is the bond of connexion between them, and between the convolutions—a mesolobe, as it was termed by Chaussier. It is wanting in a few of the lowest mammalia, amongst the marsupials. Spurzheim, however,

* With the addition of some fibres from the pyramids.

† A long process of the corpus striatum may also be seen on the roof of the inferior horn of the lateral ventricle.

denies its being a commissure, and gives instances where (in hydrocephalus) it has appeared to be quite destroyed, without loss of the faculties.*

It may be understood that the diverging and converging layers of the brain may leave vacuities between them, which in fact they do; there is a large lateral ventricle in each hemisphere, having three horns or processes. Whatever uses may be referred to these cavities, or to the serum which moistens them, they must be a great safeguard to regulate equality of pressure within the cranium, a little more or a little less secretion would accomplish this. Between the corpora striata and thalami, on the floor of the lateral ventricles, we see a curved band on each side called tænia semicircularis, connected behind apparently with the sensitive column, and perhaps placing its fibres in apposition with the motor ones of the corpus striatum. It appears to be connected before with the anterior commissure, &c. In the inferior horn we see a prominence called hippocampus, very large in some animals, and which originates above in a white membrane or antero-posterior commissure, situated on the floor of the ventricles, and called the fornix, connected with the great commissure above by the tender septum lucidum, and being a continuous duplicature of it behind. The fornix appears to connect the lower part of the middle lobes to the other commissures of the brain, and appertains probably to sensation. Both the fornix and the corpus callosum dip down in front, sending processes to the lower and anterior part of the brain, towards the course of the optic and olfactory nerves, and the mamillary bodies, where the tænia and anterior commissure also converge.

There is a third ventricle situated below the fornix, between the thalami and above the optic commissure,

* There is a case in the Trans. Med. Soc., Edin. Dr. Carpenter is disposed to consider that form of cerebral power, in which the will is scarcely concerned, the sensori-motor, as placed under the influence of the thalami (sensation) and corpora striata (motion), without the convolutions being brought into action.

pituitary gland, &c., and a fourth already mentioned. All have introduced into their interior, in various ways, processes of the delicate membranes, the pia mater and arachnoid, forming, with the internal arteries, peculiar plexuses; the dura mater constituting the strong external defensive envelope of the brain.* The former are sometimes infiltrated with pigment, as is seen in the frog, or in front of the brain of some sheep.

We are disposed to consider the cerebellum as the seat of the muscular sense, and of the power by which the muscular balance and movements of the body are accomplished. It is very small in the infant,† but increases rapidly as the muscles and motions are more developed, though it does not attain its full size till middle life. Its ratio to the cerebrum "undergoes but little change during the whole period of life, after the expiration of the first year." Before childhood is passed, the cerebrum attains a large, but not its full size by about a tenth. It is largest in middle life, decreasing as we grow old.‡ Its average weight, according to Dr. Peacock, in adult males, is about forty-four ounces, and in females thirty-nine ounces. This larger size of the male cerebrum is not however in due proportion and extent to the size of the body, but the reverse.§ But to return to the cerebellum, the experiments of Rolando and Flourens prove the truth of the view we have taken, and we have given others in different parts of this work. The case of the dolphin might be

* Whatever may be the function of the choroid plexus, probably the secretion of the ventricular fluid, it appears to be formed from duplicatures of the membranes which, during the development of the brain, send processes into the convolutions. Desmoulins.

† In one case we found it, at birth, about the eighteenth part of the weight of the cerebrum.

‡ The skulls of very old men are remarkably sunken about the upper part of each parietal bone.

§ Tables by T. B. Peacock, M.D. See also Quain's Anatomy, where is a summary of the tables of others on this point. The average weight of the whole male encephalon is given as forty-nine ounces, of the female forty-four ounces. Cuvier's brain weighed sixty-four ounces, Abercrombie's sixty three.

brought as an adverse argument; it has a large cerebellum, though extremities are only partially developed; yet the animal is proverbial for its powerful and rapid movements. And, with respect to the brain of the cetacea, always highly developed, we think that quality as well as quantity should be investigated, and especially specific gravity, the character of the order being to have a coarse and less elaborate texture, and in some species peculiar modes of lightening the head are resorted to by nature, as in the case of the spermaceti whale. The cerebellum may, however, be also connected with general sensation and, as the phrenologists and Serres maintain, have (with respect to its middle lobe) some connexion with the reproductive organs.

Pathology also shows, that in affections of the cerebellum the muscular motions and sensibility are much affected.

This part, the cerebellum, appears, as it were, supplementary to the cerebrum, placed on the spinal cord, with its posterior crura formed by the sensitive columns, and its anterior united with the motor cerebral descending cords in the pons. The brain appears to will movement, the cerebellum to regulate it. Dr. Hall, however, denies the existence of the muscular sense, and considers it to be, in reality, but common cutaneous sensation. He observes, that a paralytic lets an object fall from a half paralysed hand, unless the eye is kept directed to it, and experiences much more difficulty in walking when the eyes are closed. These facts certainly show the necessity of the connexion of vision with the motive power.

The first pair of cerebral nerves (olfactory), arise in man at the very back part of the anterior lobes, and run forwards a considerable distance within the cranium, like the optic nerves. The roots of each nerve appear to communicate together internally, wend towards the island of Reil externally, and join in the middle the anterior commissure, the perforated place, and certainly in animals the middle lobes, which led Spurzheim to refer their origin to the hippocampus; in fact, they are seen in many mammalia, as the

hog or the horse, for instance, of an enormous size, in apposition to the extremity of that body in the descending cornu of the middle lobe. Their attachments are, in few words, principally the cerebrum ; in man the anterior lobe (intellectual), in animals the middle (sensorial), in lower animals the medulla. We have described them and their two origins in fishes ; they are absent in some cetacea, and in such cases, as in the dolphin, according to Serres' plate, the tuber cinereum and pituitary body are absent, which however, from inspections of the specimens (imperfect) in the College of Surgeons, we doubt. The corpora striata and testes are certainly present. These nerves in animals have often large bulbs at their anterior extremities. In such animals they are often hollow, as in the horse (Pl. VII., Fig. 5), or ostrich, having their cavities sometimes also connected with the ventricles. The sense of smell in such an animal must be exquisite, and intimately connected with functions, to which in us it has no relation.

The second pair of cerebral nerves (optic), forming the retina, or sensitive membrane at the bottom of the eye, after leaving the orbits, unite, in man and most animals, into their remarkable commissure, behind which they are intimately connected with the tuber cinereum, and so may be brought in connexion with other nerves, as the motors of the eye; the nerves then diverging twine round the crura of the brain, to attain the posterior part of the pedicle, the sensitive tract, where they meet, and in man and several animals, are more particularly united to the thalami, as already observed, or to the centre of cerebral sensation, but, in animals generally, more particularly to the optic lobes or corpora quadrigemina, and are thus connected with the regulation of lower powers, principally the respiratory and muscular movements, as indeed is the opinion of Carpenter. According to Serres, amaurosis has been attended by a wasting of the corpora quadrigemina, and that on the opposite side, and the experiments of Flourens appear to prove this connexion. Wenzel, however, relates that the thalamus is wasted in

blindness, and the same may be noticed in the preparation of a blind horse in the College of Surgeons. In the lower vertebrata, as in most fishes, unless they, like the pike, require the capacity of looking in front directly, the optic nerve of one side crosses over to supply the eye of the other; in such case the animal has probably two distinct round fields of vision, as we have one oval one; in most other cases the two optic nerves are curiously united in a commissure or chiasma. There is a difference of opinion as to the particular mode of the union of the two nerves at this point, but the commissure probably explains why objects placed before us, and consequently seen with both eyes, are seen single, and doubly distinct, the impression of both retinæ being regulated in the commissure.* In the cyclopterus the optic nerves are united together, and, according to Desmoulins, have no connexion with the brain, but are closely covered by the pituitary body. With respect to this pituitary body or gland, and the pineal also, we may observe that both agree in not consisting of normal nervous tissue, and being in connexion with the principal bloodvessels. The pedicle of the pituitary is hollow, at least in animals, and leads into the third ventricle through the tuber cinereum. The gland itself is carefully protected, as is well known, and also connected with the little white prominences, corpora albicantia, and through them with the fornix or sensorial commissure. In some birds the pituitary gland is prolonged far into a bony canal at the base of the brain, in contact with the large bloodvessels. It is large and glandular in the calf and horse. The pineal gland, situated near the origin of the optic nerves, is a still greater enigma than the pituitary; as is well known, it often contains gritty earthy matter; a faint tract running on the inner side of each thalamus appears to connect this body with the corpora albicantia.

The third nerves (motores oculorum), and sixth (abducentes)

* The commissure is also a crossing by which the optic is placed in the same arrangement as the other nerves. The nerves of some fishes cross but do not touch.

supply the four recti muscles of the eye, and others also in some animals; evidently motor from this circumstance, and from their arising from the anterior tract, one just before, the other behind the pons. The third, however, is considered by many, as by Malacarne and Swan, to have another root near that of the fourth (patheticus), which goes to the superior oblique muscle of the eye, and was considered by Bell to be a nerve of the respiratory class, causing those involuntary movements which the eye undergoes in passion, rapture, fainting, anger, sleep, danger of injury, &c. It, the fourth, indeed appears to be a sensorio-respiratory nerve, if we may use such a term, being probably connected with those two fuuctions at their principal foci. The similar origin of one part of the third, would account for its supplying the inferior oblique, which, conjoined with the superior oblique, according to Bell, produces the upward and inward rolling of the eye already alluded to, though some doubt this view, and consider the oblique muscles to be rotators of the eye on its antero-posterior axis.

Nature appears to have been incapable of accomplishing the consentaneous action of the four recti-muscles in each eye by means of a single nerve on each side, the external rectus being supplied by the abducens or sixth. Without entering into particulars, we may observe, that these motions of the eyes are probably the most compound and complicated voluntary movements in the body, and, at the same time in the normal state, are preserved in perfect unison. The third is the only motor nerve arising before the pons, the sixth having its origin just behind it. Are not the superior and inferior recti peculiar in our not having the power to separate their action as to the corresponding muscles of the two eyes? *

* The third nerve has in some animals a root from the pons, by which arrangement perhaps the internal recti act independently of each other, in looking sideways, being antagonised, like the other muscles of the body, by the external recti; the converging action of the two muscles is consentaneous.

The fourth nerve (patheticus) has already come under our notice, taking its origin on the valve of Vieussens, and curiously winding a long course, though but a delicate thread, to attain the involuntary superior oblique muscle of the eye. In many animals the two nerves join together and do not appear attached at all to the encephalon. The fourth nerve in fishes certainly sometimes originates from beneath and behind the optic lobes, as in man; a fact, denied by the generally accurate Desmoulins.

The fifth pair of nerves (trigemini) are very large; enormous in such animals as have the face or its appendages much developed. Bell considered it to arise by a double root, one being a smaller motor portion, generally allowed to arise from the pons and the anterior crura of the cerebellum, the other, the large sensory root, as plainly traceable to the posterior columns of the medulla oblongata, but no doubt in part from the middle involuntary tract; and this circumstance throws light on various phenomena, for instance, why irritating the nasal fossæ should produce the convulsive respiratory action of sneezing, the consent of the buccal, palatal, and other muscles in yawning and breathing, the loss of taste in catarrhs, &c. We have already mentioned the Casserian ganglion, combining the three nerves, going through the orbit and upper and lower jaws. The motor portion of the nerve does not enter the ganglion, but is distributed, in conjunction with the sensitive part of the third branch of the nerve, to the muscles and parts of mastication. Another important function, a modification, however, of common sensation, taste, is said by some to be the endowment of the lingual branch of this inferior maxillary nerve, but to form which, under the name of gustatory nerve, the lingual first receives a small but remarkable nerve, the Vidian.* When the fifth nerve is diseased it gives the

* According to Valentin, the glosso-pharyngeal is the sensuous, the fifth the sensitive nerve of the tongue. When irritated experimentally, the glosso-pharyngeal appears in some instances to have produced pain, in others muscular contractions of the parts to which it is distributed, as

exquisite pain of tic douloureux, when it is paralysed loss of sensation in the face takes place, also the power of feeling or moving the food in the affected side of the mouth; in some cases, perhaps, the motor portion may be unaffected, and then the patient would still have the power of using the temporal and masseter muscles, and of biting. In these cases of paralysis smell and sight remain, but the sensibility of the ocular envelopes, its great safeguard being gone, in chronic cases the cornea becomes opaque from attacks of inflammation. Motion of the face remains perfect, at least the involuntary or respiratory motions derived from the seventh nerve.

The sixth nerve (abducens oculi) arises from the corpora pyramidalia, immediately behind the pons from which it receives some fibres; it has been already mentioned as a motor nerve of the eye.

The seventh nerve consists of two others, very different in function. The auditory or nerve of hearing (portio mollis), originates from the posterior part of the medulla oblongata at the bottom of the fourth ventricle, and the facial (portio dura) is placed in apposition with it in its course, conveying motion to the superficial muscles of the face, and no doubt originating from the middle respiratory tract, in some animals perhaps rather from the motor tract, and in them it may be an ordinary motor nerve. Paralysis of this nerve on one side is very common, being popularly known as a blight, and is often more curious than serious, yet even now not understood by some. Its cause is seldom dependent on cerebral lesion, but on cold, enlarged glands, earache, &c. The symptoms are interesting; the face on the affected side is perfectly inanimate in talking, smiling, or sneezing, whilst the corresponding muscles of the other side, having lost the resistance of their antagonists, draw up the features and

well as increased flow of saliva, these last probably by reflex action. We believe Valentin's view to be correct; the back of the palate certainly has taste, as may be proved by touching it with a stick of sugar—it has nerves from the glosso-pharyngeal, but not from the gustatory.

mouth in a remarkable manner; the orbicularis of the eyelids cannot close the eye, and some inflammation of this organ may thus arise in this case, as in paralysis of the fifth. A common case is now before the author, in a young woman, who twelve months back had the affection on the opposite side—earache preceded the attack for about a fortnight, pain in the face and neck extending to the shoulder, curious distortion when she attempts to whistle or smile, slight numbness or stiffness on the affected side, and of that side of the tongue, which is protruded straight, smell and taste affected a little on the same side. Bernard attributes the last symptom to the chorda tympani branch being affected.

The auditory nerve accompanying the facial part way through the temporal bone, enters the internal ear, that beautiful organ which in all animals seems to have its nerves in relation to the respiratory, constituting a provision for the animal's safety in case of surprise or attack, as well as a relation between the voice and hearing. The auditory no doubt also has other connexions with the greater nervous centres, the cerebrum and cerebellum.

The eighth or proper respiratory nerves may be divided into three others on each side, the glosso-pharyngeal, the pneumo-gastric or vagus, and the spinal accessory. All of these may be said to arise in a line, by many roots or funiculi, from the lateral columns, the last as low down as the sixth cervical nerve, rising up into the skull, and again making its exit with the glosso-pharyngeal and vagus. We shall refer to these again. The eighth nerve in fishes gives branches to the side of the body, and is one of the electro-motor nerves of the torpedo ; in the carp it forms, according to Desmoulins, the nerve of taste. The vagus has been supposed to be sensitive as well as respiratory, the spinal accessory purely motor, but the anatomy does not quite agree with this last view. That the latter is motor and efferent indeed has been proved, because when it is cut across, and the distal end irritated, muscular movement has taken place; when the cut end next the brain is irritated no motion is

produced in the vagus or any other respiratory nerve, proving the spinal accessory not to be a nerve of sensation or afferent. Hence Bernard, Reid, and Valentin, consider its functions to be motor and not respiratory, but its peculiar and curious origin and connexions appear to connect it with the latter system. When both the vagus and spinal accessory are cut across experimentally the movements of swallowing are spoiled, the food remaining in the passage to the stomach. The upper laryngeal branch of the vagus is probably sensitive as far as the larynx is concerned, the lower motor. When the trunk of the vagus is irritated, the movements of the stomach, heart, and bowels, are affected. Dr. Reid found on cutting that nerve, that the movements of the heart slackened—on removing the brain they fell still more.

The ninth nerve (lingual or hypoglossal) supplies the muscles of the tongue, and arises from the same line as the motor roots of the spinal nerves. The tongue has, however, two other principal nerves, and the ninth in man is perhaps the nerve of speech in conjunction, it may be, with the inferior maxillary branch of the fifth, but much more with his higher intellectual faculties. It gives off a curious branch descending in the neck, which connects it with the phrenic and diaphragm (sometimes given off by the vagus), the meaning of which appears obvious. The respiratory movements of the tongue and pharynx, some will say, depend upon the glosso-pharyngeal; the sympathy of these two latter parts is required in the act of breathing, and particularly breathing in combination with swallowing.

The tenth nerve (suboccipital) is analogous to the other spinal nerves. It is sometimes, however, destitute of a posterior root.

The brain itself has no nerves, but there are some fine twigs, especially from the sympathetic, which go to the meninges, and also send up branches along the great vessels, and form some small ganglia upon them; in fact this nerve may be said to communicate with all the cerebral nerves, and particularly with several ganglia situated upon them—

the ciliary or lenticular, for instance, in the orbit, mentioned already. Meckel's ganglion is situated in the spheno-palatine fissure, uniting the nerves of the maxillary division of the fifth before they go to, or rather leave the middle parts of the face, the nose, palate, antrum, orbit, and pharynx, in the same way that the Casserian ganglion unites the primary division of the same nerve, also communicating with the general ganglionic system by means of the Vidian nerve, and some of its filaments, it may be, conferring that gustatory power to the back of the palate which it evidently possesses; the Vidian also appearing to be a curious connexion between the palate, the gustatory nerve, and the salivary ganglia.

There are some very curious nervous connexions in the internal ear and temporal bone by means of minute branches of nerves—of the fifth and the Vidian, the sympathetic, the facial, the glosso-pharyngeal, and the vagus—in this minute cavity, or just around it, anastomose nerves of sense, common sensation, motion, respiration, and organic life. The keen eyes of modern anatomists have traced these apparently constant and regular filaments, and discovered other minute ganglia which cannot be described here, the *media* probably of different sympathies about the head and face. The submaxillary ganglion supplies the gland of that name, curiously connected with the gustatory nerve as already observed.

The union of the branches of the fifth nerve in the ganglia of Casserius and Meckel, explains how, in irritation of one branch of the nerve (from a carious tooth, for instance), the sensation may be reflected and attributed to the extremity of some other.

The spinal cord is double and symmetrical like the brain. The principal prominences above have no doubt tracts continued from them downwards, being marked more or less by grooves, the anterior tracts (motor), the two lateral (respiratory), and the two posterior (sensitive). The anterior and posterior roots of the nerves also, arising from the slight

lateral grooves, help to demonstrate the existence of these columns. Even the lateral columns are probably continued far down the cord ; the abdominal muscles, in fact, are often agents in respiration, and they are supplied by the lower dorsal nerves. A horizontal section of the cord shows a white matter without, but internally an appearance of two crescentric *nuclei* of ganglionic matter, disposed *dos à dos*, and with their *cornua* directed towards the lateral grooves. An internal canal is found in the fœtus. One would suppose that this grey matter must be a source of power, whilst the white fibrous matter appears to us evidently continuous longitudinally, and it must constitute a medium of the nervous communication. After the spinal nerves are formed by the union of the motor and sensorial roots, they give off in front one or more twigs to the spinal ganglia of the sympathetic nerve, and thus, perhaps, the voluntary muscles are brought in unison with the heart, lungs, stomach, &c., and this sympathetic system is supplied with motor power, and capacity of conveying its impressions to the cerebro-spinal system. We need not describe the spinal nerves—seven cervical, twelve dorsal, five lumbar, and about six sacral. Part of the third, fourth, fifth, sixth, and seventh cervical, and part of the first dorsal, form that curious interlacement—the brachial plexus for the supply of the arm.

It is not unlikely that the ganglia situated upon the posterior roots of the spinal nerves, are partly for the purpose of uniting the posterior nerves supplying the posterior part of the body with those of the anterior part, and also the successive nerves together, as the Casserian ganglion does the branches of the trigemini, supplying the three portions of the face. Their situation not behind the point where the motor and sensitive nerves unite, but rather where the posterior branches of the spinal nerves are given off, seems to indicate as much. By plexuses, the brachial for instance the action of muscles appears to be placed in combination ; if each nerve supplying the muscles of an extremity were not connected with its fellows, it is probable,

that in a strong exertion or struggle, all the different sets of muscles, both flexors and extensors, could with difficulty be kept in action at the same time, through the volition and regulating power of the cerebellum. By means of a plexus, too, the action of a few of the muscles may contract in unison, as the flexors or extensors exclusively, for instance, or those of one articulation or appendage of a limb. We see in the upper extremity the nerves of the shoulder and breast, and the different articulations, successively given off by the brachial plexus, and apparently those of the highest articulations from the highest spinal nerves, as also the extensors, the great extensor being given off also before the flexors. The two principal flexors anastomose as they descend to combine the flexor movements of the fingers; the extensor does not communicate with them, but does with such nerves as go to the chest and shoulders, and govern such of their actions as are most connected with the extension of the arm and forearm. The practical art of the pianist depends a good deal upon his power to separate the organically combined motions of the fingers—he often experiences most difficulty with the ring finger. A partial paralysis of one or more of these nerves is often seen from local pressure, as the use of crutches; the circumflex or radial may be injured by a tight garment in the axilla, during parturition, for instance, and the latter by pressure on the nerve where it winds round the bone during sleep. Mr. Erichsen records, that in two cases of paralysis from spinal lesion, opposite the sixth cervical vertebra, it was only partial on the ulnar, and not at all on the radial side of the arm; in both cases there was acute cutaneous sensibility along the line of junction between the paralysed and sound parts. Some plexuses may be for the mingling of different nervous powers, or for the ensuring of nervous supply.

The lower extremity is supplied in a similar way to the upper. But some of the natural movements of this extremity are lost by civilized men, who excite the pity of their

savage brethren in this respect; we see, for instance, that the infant can spread out its toes laterally, a movement which we do not possess as adults. The Australian finds no difficulty in pilfering with his foot.

Certain muscular nerves are derived from the cervical nerves and brachial plexus, which may be considered as respiratory ones, or perhaps as having a compound function, the muscles which they supply assisting in locomotion, and in that respect strictly voluntary, but also agents in respiration, particularly when that function is excited. Part of the upper nerve of the plexus, in conjunction, generally, with one or more of the adjacent cervical nerves, forms the phrenic, or internal muscular respiratory nerve, going to the diaphragm, and causing that muscle to act in ordinary respiration.* The external respiratory of Bell is formed by the two upper nerves of the plexus, and is given to the external muscles of the chest. We may infer the plexus then to have fibrillæ from the respiratory tract.

There are spinal nerves distributed to the outlets of the body, conferring, in the first place, those peculiar sensations with which they are, like the inlets, endowed, and producing when irritated a variety of consentaneous reflex actions of the respiratory, motor, and ganglionic systems. In defæcation we have first the desire, then the involuntary and, perhaps, voluntary action of the large intestine, and also the contraction of the abdominal muscles, met by that of the levator ani below, which also opens the sphincter, the two latter muscles being supplied by branches of the same nerve. In paraplegia both levator and sphincter are paralysed, and the latter is open, a degree of contraction being therefore natural to it. Curious sympathies are also connected with the uterus, and exist between the glans, testes, and ejaculators, the back of the urethra and bladder, the external genitalia muliebria and the Fallopian tubes, &c.

We need not describe the ganglionic system, its connexions with the various nerves of the body, not however extending

* See in the anatomy of this nerve a review of "Luschke's Monograph," by Mr. Ellis. Med. Chir. Rev., October, 1853.

as a distinct and separate system, into the extremities, and its great central (semilunar) ganglion and (solar) plexus, situated always near the stomach. We believe this to be in Bichat's words, "the nervous system of organic life." It partly supplies, in the thorax, the heart and lungs, whose functions are, however, in relation with the external elements, and therefore partly supplied with respiratory nerves, the two inosculating together. The abdominal viscera are supplied by the different sympathetic plexuses, several of these organs, however, being brought in necessary sympathy with the organs of the thorax, &c., by twigs from the great respiratory nerve. Below, the ganglionic system is united to, and in sympathy with, the spinal nerves, as already described, rendering perfect the actions of organic life at the outlets of the body. In the neck ganglionic nerves help to supply the thyroid, the trachea, and the larynx, in unison with respiratory nerves; they connect all those great nerves at their exit from the skull, whilst others ascend upwards and communicate with the cerebral nerves.

If Sir C. Bell had made no other discoveries in medical science, we should be still indebted to him for his luminous views on respiration, and the nerves connected with it. Some may still have doubts respecting his opinions in regard to the medulla oblongata, the cephalic nerves, or the intervertebral ganglia, but all will admit that he has often thrown much light on the functions of many important nerves and organs. Respiration, on which the life of the animal so much hangs, is not, strictly speaking, dependent on nervous energy from the brain. Thus it is continued in a quiet state during sleep, and the acephalous monster lives for days. On the other hand, a man may live some time with the lower part of the neck broken, providing the lesion is below the origin of the phrenic nerve. The ordinary respiratory tract must then be between these two points.

The heart is bound in unison with the lungs by their common nerves, respiration becoming more frequent with the pulse, and *vice versâ*. But it also continues in its action

for a time when respiration is stopped by apoplexy, prussic acid, injury of the brain, or even when torn from the body, yet probably it would not do so were its ganglionic nerves to be destroyed. To ordinary sensation it was shown by Harvey not to be liable; its only sensibility, if any, being due to the presence of its own blood. The cardiac plexuses supplying it, as observed before, are the result of the union of the vagus with organic nerves. These nerves are still, however, influenced by the impressions of the feelings, and probably by any shock to the brain or spinal cord. The nervus vagus must also bind the heart in strict sympathy with the stomach, and probably other organs. The lungs are supplied in a similar manner from the same nerves; but it is to be observed that they are connected in several important ways with other muscular parts, for the lungs themselves are merely passive in the mechanical act of respiration, and the air cannot enter them except by an expansion of the walls of the chest, like that of a pair of bellows. This expansion is produced by certain muscles, ordinarily the intercostals and diaphragm, and they must be stimulated into action by impulse from nerves—the phrenic with regard to the diaphragm, the intercostal nerves and external respiratory ones as concerns the bony thorax. Again, the inlet for the air into the lungs is not the open metallic nozzle of the bellows, but a sensitive valve, which is, by its occasional closure, also the safeguard of the lungs from the intrusion of foreign bodies, such as meat or drink taken into the mouth and swallowed. It is also the organ of the voice, or at least of uttered sound, and therefore this inlet, the larynx, must be bound in sympathy with the lungs, and indeed with other parts concerned in the action of swallowing, and in articulation. To accomplish the opening and closing of the valve, it is curiously supplied with nerves from the cardiac and pulmonary plexus, called the recurrent, from their extraordinary backward course. The former action (the opening of the larynx) being so important in inspiration, it seems to have been necessary

that the connexion between it and the remote lungs should have been in the most direct line. When these recurrent nerves are at all pressed upon by any tumour or aneurism, it it observed that the voice is destroyed. The lungs are made conscious of any danger of foreign intrusion through the larynx, by the sensitive branches of the superior laryngeal nerves, given off, higher up in the neck, to the mucous membrane, and also, perhaps, regulating, in singing or speech, the voice. The direct sympathy between the chink of the larynx and the lungs is instinctive and unconscious. Without this connexion, no inspiration, nor a sound, nor a cough could be produced. Though the recurrent appear, from the morbid phenomena alluded to, to be the vocal nerves, yet the upper laryngeal, the ninth, and the second branch of the fifth, appear to govern articulated voice. Laryngismus and the spasmodic inspiration of hooping-cough must be connected with the recurrent. The drunkard sooner loses the control over his voluntary muscles of articulation than over those of inspiration, though he may finally do so over the latter, as is seen at last in the *stertor*. These latter nerves are affected also in apoplexy, and other brain affections, and may be considered, therefore, partly voluntary; the same occurs in deep sleep.

The active agents in respiration are the diaphragm and muscles of the chest, acted upon by the phrenic, external respiratory and intercostal nerves, or, occasionally, even the muscles of the abdomen, as is seen in what is called abdominal breathing. The phrenic nerve runs down from the neck over the heart and lungs to that great muscular partition between the thorax and abdomen, the diaphragm or midriff, the principal agent in inspiration. Besides the external respiratory nerves already mentioned, the spinal accessory, more evidently arising from the respiratory, involuntary, or middle tract, mounts, as before alluded to, into the base of the skull, apparently for the purpose of having its origin connected with the internal respiratory nerves at their exit, and thus this efficient muscular cause

of excited breathing is bound in sympathy with the lungs and heart. The external muscles are more or less employed in breathing. In the asthmatic we see them in violent action ; they are perhaps, in this case, strictly speaking, voluntary, but the propensity to employ them is irresistible, or suffocation would ensue. In sleep the voluntary effort would cease, and consequently the asthmatic cannot close his eyes. Injury to the spinal cord, at the part where the respiratory nerves originate, is more speedily fatal than injury of the nervous system either above or below. The facial nerve, at least in man, is evidently connected with the respiration, the play of the muscles of the mouth and nostrils being requisite in that act, and the connexion too of respiration with the act of laughing, crying, &c., is evident. The portio dura, therefore, is connected at its origin with the other respiratory nerves. Intimately regulated in unison with the respiratory opening and tube, are the pharynx and œsophagus, leading down to the stomach, together with the tongue and mouth; any derangement in the act of swallowing or the action of the larynx might have an instantaneous and fatal effect.

The sensibility of the base of the tongue is very peculiar, like others which we have mentioned, but very different from that of the larynx, one bringing on vomiting, the other coughing. The glosso-pharyngeal nerve, which is evidently distributed to the mucous membrane, probably bestows this peculiar feeling, and this is confirmed by Dr. Reid's researches. The wonderful muscular action of the gullet, however, principally depends upon the vagus (aided by some other nerves and muscles) and this nerve is intimately connected with the former (glosso-pharyngeal), and also distributed below to the stomach itself. Though in vomiting the diaphragm and abdominal muscles strongly act, and, as Majendie showed, may produce it without the muscular action of the stomach; this cannot be supposed to be always the case.*

* Notwithstanding the experiments of Dr. Philip, it would appear that the secreting and digesting power of the stomach does not depend

If the larynx is irritated by the smallest crumb, occlusion takes place, and then an attempt is made to expel it by a violent coughing, a reason for the close nervous *liaison* between the larynx and lungs. We have mentioned the influence of the fifth nerve in producing sneezing, and have explained it by considering it as partly a nerve of respiration, according to the views now held respecting its origin. Majendie was surprised that he could produce sneezing after dividing the nerve of smell, and founded some erroneous views on that and similar experiments.

We see remarkable instances of this sympathy, called diastaltic action by Dr. Hall, in the case of epilepsy from teething, in the inhalation of the new born infant, particularly when it is brought about by puffing sharply the air upon its lips and mouth, a powerful means of resuscitating it in suspended animation,† also in the power of cold in producing inspiratory efforts, as is seen in bathing or in the half suffocated individual.

In hiccough, the extremities of the vagus, at the cardiac orifice of the stomach are irritated by acrid matter, or too full a stomach, and the violent inspiration marking the phenomenon is caused. Laughing, sobbing, and crying are, physically speaking, similar acts ; the inspirations short, spasmodic and curtailed, the expirations prolonged, and the facial nerve strongly implicated. Sighing is common in faintness, and when the breathing has been allowed to flag under intense attention or during sleep, and is evidently an effort to goad on respiration and circulation. We observe the same in coma.

To ascertain the functions of different parts of the encephalon, numerous rather cruel and unjustifiable experiments have been made. When the cerebellum has been injured or

upon the vagus, much less that galvanism affords an equally efficient stimulus with the nervous force. The ganglionic system is probably the chief source of nervous power in the stomach.

† It is really marvellous what a long time after the delivery the asphyxiated infant may be recovered by perseverance.

removed, the muscles of the body still act, apparently from volition, but their sympathy and co-ordinate action is at the least deranged;* according to Flourens, a cock, after its removal, still showed its usual gallantry. Injuries of the corpora quadrigemina produce rotation to the injured side, and affect the eyes in a crossed direction, causing blindness and also squinting or distortion of the organ to the same side, they likewise affect the pupil. When the great commissure of the brain has been divided, death has taken place, after great constitutional disturbance, particularly nervous, and of the stomach and bowels. Injury of the corpus striatum paralyses the limbs, both anterior and posterior; it also affects the thoracic and abdominal organs, even after division of the vagus. We see similar effects to these last in disease, as in lesions of the deep parts of the brain, showing the connexion of the different nervous systems. The parts of the brain appearing most sensitive to injury are the medullary tracts at the base of the brain; the convolutions and external parts are the reverse. Amongst the most curious phenomena elicited by these experiments are certain peculiar motions called compulsory, by Valentin; thus, if the side of the pons is divided, a rotation of the animal to the same side takes place; the more decided, the more distant from the central line; but if the same is done on the opposite side, the animal remains quiet; if the incision is in the middle, according to Majendie, oscillatory movements take place. Similar motions, but reversed, also take place on injury of the crura or lobes of the cerebellum, and the corpora striata or hemispheres, the eyes being sometimes distorted. A division of the medulla oblongata on one side produced curvature in the neck and affected station particularly. Sometimes backward or forward movements have been produced by injuries of the cerebellum; the latter, according to

* Desmoulins and Majendie, however, question this, and instance the frog and experiments on it,—on removing the small transverse *lamina*, perhaps corresponding to the cerebellum, the animal could no longer leap, but yet retained the power of swimming.

Valentin, when the corpus striatum has been injured, but he thinks, from the optic nerves being accidentally interfered with, perhaps simply by the violent shock produced by such a lesion in the centre of the motor seat. Facial paralysis, it is said, has followed injury of the hippocampus major, a sufficiently unintelligible effect, as in fact is the case in many of these experiments. If one hemisphere of the cerebrum of the dog is removed, paralysis, blindness, rotation, &c., are produced, but intelligence has continued; if both are taken away, reflex automatic motion, of course, is only left.

The following pathological conclusions have been drawn up from numerous cases reported in the journals; from those in the works of Abercrombie, Bright, Parry, Serres, &c. They are, however, not offered as anything more than suggestions for future inquiry, nor with the conviction that all, nor even most, of the observations, are to be relied upon.

DISEASES OF THE NERVOUS SYSTEM.

When the meninges are principally affected, we have, commonly, *excitement of the senses, delirium, watching, mania,* suffusion of the eyes. *Pain.* Sometimes convulsions or coma, also vomiting. If their structure is altered, epilepsy may occur. No paralysis.

Amongst the symptoms, when the substance of the cerebrum is altered, are vomiting, the speech and deglutition affected, *hemiplegia,* or even paraplegia of the limbs, and *paralysis of the face,* but perhaps these are most certainly produced when the thalami or corpora striata are implicated. *Convulsions, coma,* or *apoplexy.* All the organs of sense may be altered. *Intellect also.* Apoplexy may exist without any discoverable lesion in the brain, and, on the contrary, the brain may be disorganised through one hemisphere with little result, no paralysis, or amaurosis, and little coma.

When the ventricles are affected with effusion or disease

of the walls, we may have pains, vertigo, delirium, *coma.* Vomiting. Intolerance of light, squinting, and *amaurosis,* with *dilated pupils.* Speech and deglutition affected. Muscular contractions, hemiplegia, or occasionally paraplegia. The face sometimes paralysed. In the remarkable case of the hydrocephalic man, Cardinal, it was observed that dreaming never occurred.

When the anterior lobes of the brain have been exclusively affected, there has been noticed *paralysis of the limbs* and *face* (according to Serres, the legs particularly ?), the former on the contrary side to the lesion, but the latter (ptosis), in some cases, on the same side. When there has been facial paralysis, the senses have been sometimes unaffected. Contractions or tetanic symptoms. *Amaurosis. Speech and memory,* particularly of names or language, injured. *Delirium* and other *mental disturbance.*

In cases where the middle lobes have been diseased, *paralysis of the arm, leg, and face,* have been common. Speech and deglutition affected. Convulsions and epilepsy. The *mind affected.*

When the posterior lobes are diseased, paralysis may affect the *arm, or leg, and face* (according to some the arm particularly), the facial paralysis sometimes on the same side as the disease, on the opposite side to that of the arm- or leg-paralysis. *Epilepsy, coma, delirium,* and misapplication of words. *Squinting and amaurosis.*

The corpora striata.—In one remarkable case, reported by Abercrombie, sensation in the limbs was affected, and not motion. The paralysis is often in the leg if these bodies are affected in front (Serres and others, who are contradicted by Andral), but it also occurs in the arm and face. Vomiting, convulsions, or epilepsy, difficult deglutition, *affected vision and speech. Strabismus. Memory and intellect affected. Coma.* Epilepsy and coma have occurred when the corpus callosum has been affected—the former also when the pituitary gland or sella turcica was diseased, together with vomiting, coma, strabismus, and amaurosis.

When the thalami are affected, there appears to be *crossed paralysis*, of the arm particularly. *Amaurosis.* Paralysis, both in regard to sensation and motion.

If the fornix is affected, the *speech* is imperfect, there is *double vision, contractions* and *convulsions of the limbs. Incoherence, loquacity, delirium, stupor, and coma.*

When the cerebellum is diseased, it would appear that there are spasms and *unsteadiness* of the muscles, vertigo, *tetanic symptoms, hysteria, tremors, violent and peculiar motions, convulsions, epilepsy.* Pain. If the middle lobe is affected, sexual symptoms (Serres). Crossed paralysis (of the lower extremities according to some). Vomiting. Speech and *swallowing* affected, also *vision, squinting, deafness.* Memory affected, stupor, and sometimes sudden apoplexy, but commonly the *mind is not extinct.*

Pons Varolii. Crossed paralysis. Sensation not always destroyed with motion. *Rigidity of the limbs*, extensors or flexors. Speech and the *sensation* of the face affected. Ulceration of the cornea in consequence of injury of the fifth nerve. The head may be distorted backwards. Squinting, dilation of the pupil, ptosis, deafness. Respiration and deglutition appear to have been affected, particularly when the corpora olivaria, crura cerebelli, or corpora quadrigemina were diseased. The latter, according to Serres, when diseased, have affected the command over the movements, and caused a sort of chorea ; but according to others, vision is more affected. In some cases of paralysis, articulation and not the voice or understanding of language is affected ; but either may be so, and also the memory, causing the use of wrong words. Some paralytics write the proper words, but are not able to speak them, or may understand them when written, but not when spoken.

Nerves.—When the recurrent has been pressed upon, loss of voice has occurred. The tongue may be protruded well or laterally, and at the same time difficulty of swallowing be present. If the facial nerve is affected, the lesion in the brain may be on the opposite side to the paralysis. If deafness occurs

with paralysis of the facial, the prognosis may be serious. In paralysis of the fifth nerve taste is said to become extinct, the nostril with the face insensible, but smell remains perfect, the cornea becomes opaque. In paralysis of the third and sixth nerves the eye may be turned inwards from the action of the involuntary muscles, but the same may occur from paralysis of the sixth only. In fracture of the skull blindness may occur on the opposite side. In a wound over the right eye, the fifth nerve, on the opposite side, was affected; this crossed effect is not always the case.

Symptoms of spinal disease may exist, and no corresponding *post-mortem* appearance be afterwards discovered. Spinal affection may cause disturbance of the intellectual powers, or affect the voice, speech, hearing, and sight, as in the case of the Marquess de Causan, as reported by Portal, or disturb the motions of the eyes or face. Difficulty of swallowing, oppression, palpitation and dyspnœa are common symptoms; also effects like those seen in chorea, tetanus, or hydrophobia. The paralysis present is commonly paraplegia, or of the rectum and bladder. Sensation or motion may be most affected. In spinal injury the bladder and abdominal muscles may be affected and not the legs. In fracture of the spine the penis is often erect, and reflex movements may generally be produced.

We have thus ventured, in the above chapter, to review this difficult subject—the nervous system, and have endeavoured to add our mite towards its comparative anatomy. However much may remain to be elucidated, we think we may affirm that during the present century much has been rendered plain by the labours of such men as Bell, Reid, Hall, or Du Bois Reymond, so that we doubt not, that in the course of a few more years, the different functions of the cerebro-spinal system will be correctly appropriated to their corresponding parts or ganglia, so far as they are dependent on such an arrangement, and not simply on that connexion of the spiritual and corporeal, which must for ever remain a mystery.

CHAPTER III.

Physiological and pathological chemistry—or chemistry in connexion with the functions, changes, and diseases of our bodies.

Chemistry properly applied must always have a beneficial influence on the progress of medicine, whilst, on the contrary, when *misapplied*, it has often notably retarded it. For a long period, previous to the time of Boerhaave, and particularly in his country, such a misapplication had been prevalent in our art; diseases being attributed to chemical derangement of the fluids, or to processes of a chemical nature, without any appeal to the experimental proofs. In Boerhaave's writings, illustrious though he was in other

respects, such errors are but too common. These chemical doctrines waged a successful contest with the mechanical reasonings of the Italian school, being certainly more applicable in medicine; they afterwards succumbed before those of the vitalists and solidists.

The theories of Stahl particularly tended to put an end to this state of things.* We may safely conclude, that to set down diseases exclusively to a chemical alteration of the fluids, or to actions in the economy identical with those of chemistry, the vital force being totally ignored, is a grave error. It is probable that few maladies arise, primarily and solely, from morbid chemical changes, though these often attend disease, and their investigation throws light upon it, and, like other symptoms, such changes often require counteraction. Thus in gout, diabetes, or typhus, we have, very clearly, chemical changes, but we opine that such diseases are not properly treated by simply endeavouring to correct such deviations.

These remarks apply to healthy actions, as well as to disease. If there are chemical phenomena in digestion, they alone do not constitute the whole function. The stomach is not a mere laboratory; no chemist can produce one of the principal organic elements formed by the vital chemistry of plants or animals, such as albumen or starch: the saliva may be a ferment, the gastric juice an acid solvent, the bile a soap, but still a presiding vital principle in the system regulates all. We cannot doubt that electricity circulates in our nerves and muscles, but it is not proved that it is identical with the nervous power, or more than in correlation with it, like caloric, for instance, or the chemical force itself.

But placing the chemical improvements in pharmacy, and particularly the interesting discoveries of new medicinal principles out of the question, and admitting that organic

* See the Introduction to Cullen's "First Lines."

chemistry is still in its infancy, it must be acknowledged that much is being done in this science to advance the progress of medicine. The analyses of Berzelius and the older chemists of the organic bodies, a subject, however, not free from difficulties, have been confirmed or rectified; the organic compounds, such as albumen, gelatine and caseine are better understood; the convertibility of different constituents into others, an interesting class of phenomena, is investigated; the nature of aliments, and their conversion into the tissues of the body; the chemical phenomena of respiration, absorption and secretion; the nature of the gastric juice, bile, chyle, &c., and the varying conditions of the renal secretion, that index of the chemical state of the body, are all exciting much interest, and another chemical pathology is becoming again predominant in medicine, under a more promising aspect. The names of Lehmann, Liebig, Bernard, Frerichs, Beaumont, Bird, Jones, &c., remind one of other similar labourers in this field.

Though the chemists may not be able to form any of the organic (yet unorganised) chemical compounds, or proximate constituents of plants and animals, yet if they can convert one into another, or into two others, such as those which appear in the system, simultaneously with the disappearance of the first, or even show such a convertibility to be possible, this demonstration becomes an interesting fact, and of use in dietetics or medicine.

Yet we would not conceal our deficiencies—the formation of the vegetable principles in the different organs of plants, the morbid states of the blood, the changes of the atmosphere in epidemics, contagions, and miasms, if they do not consist in some organic addition, we consider to be such.

Plants and animals can have no component elements but what they derive from the materials of their nutrition. It has been said that this is not always the case, with respect to the chick, for instance, but that it contains, when hatched, more lime than the fluid contents of the shell did, but this shell itself presents, after hatching, an appearance of erosion

and absorption internally. It is now an admitted fact that the simple elements cannot be transmuted, and if we analyse and obtain the elements of organised bodies, we shall know what nutriment they require. In plants, the simple elements are sulphur, phosphorus, and chlorine, with salts, earths, and metals, all probably derived from the soil; oxygen, hydrogen, carbon, abundantly furnished by water and the atmosphere, and azote, principally by the latter.* These last, the gases, with carbon, being the most important.

But when we analyse an organic body, without submitting it to the destructive and rather unsatisfactory processes requisite to obtain the above elements, but to simpler proceedings, such as boiling, distillation, maceration, the action of alcohol and ether, &c., we obtain the first mentioned *proximate constituents*, some of which contain nitrogen, and like other nitrogenous compounds, as fulminates or ferments, are very decomposable; such are gelatine, albumen, fibrine, caseine, legumine, and gluten; whilst others contain no nitrogen, but simply oxygen, hydrogen, and carbon, as gum, starch, dextrine, sugar, lignine and fat. As a general rule, carbon and its compounds prevail in plants, the nitrogenous principles in animals. Certain salts, earths, and metals, as well as water, are also present in both cases, and both have certain special products, not necessary to be considered in our general view. The above are the common constituents, perhaps varied a little in form, of all organised bodies—of animals, whether herbivorous or carnivorous; or of vegetables, whether herbage, roots, wood or grain. Plants can produce these constituents from their chemical elements in the soil or air, animals cannot. Plants, therefore, are the food furnishers of animals. There is also an inversion of phenomena in the growth of the two; in plants we have a carbonisation and deoxidation; in animals *vice versâ*. The

* Azote is found to be present in rain water. Lectures on Digestion, Respiration, &c., by Dr. Bence Jones, "Med. Times," 1851, papers to which we must acknowledge ourselves indebted.

organism of the one is greedy of the elements which the other ejects. The former perish by oxidation,* the latter by the union of their sulphur, phosphorus, or nitrogen with hydrogen, and the formation of ammonia, &c.

In both plants and animals we find a few compounds identical with those of inorganic chemistry, either taken in, ready combined in the food, or manufactured in the animal economy—water for instance. We have already observed, that though the chemist may convert one proximate constituent into another in some cases, as starch into sugar or gum, or the latter into lactic, acetic, or oxalic acid, or the curious principle discovered in muscle, kreatine, into urea, to which it has been thought to be the step, in the process of bodily disintegration, yet he cannot form from its elements one of the principal intermediate constituents, as starch, gelatine, or albumen. In a few cases, however, particularly in the natural decomposition of organisations, principles are formed, as in the case of urea or ammonia, more or less peculiar to such bodies, and which are not only easily convertible the one into the other, but which may be formed artificially, and in some cases from elements which can scarcely be said to be of an organic nature.

Organic conversions or metamorphoses can often be best produced without any powerful chemical agents, but by peculiar ones derived from organised bodies themselves, the effects of which we cannot account for on chemical prin-

* When autumnal leaves, as those of the Virginia-creeper, are confined in oxygen, they more rapidly undergo their usual change of colour than when placed in carbonic acid gas. Plants certainly give out carbonic acid in the dark; in forty-eight hours atmospheric air was rendered a non-supporter of combustion by some plants of peppermint. In the sun plants are considered to give out oxygen, but we have not been able to see that in air, confined for some time over growing sprigs of mint, in the sunshine, a taper burnt brighter, though certainly no carbonic acid is in this case given off. Carbonic acid, when added to common air soon disappears from a jar placed over growing plants, but then if water is used in the experiment itself is a cause of rapid absorption. Perhaps much of the carbon of plants is derived through the medium of water.

ciples, and which are more analogous to organic operations. In fact, somewhat of an organised structure exists in the agents which cause these actions; such are yeast, diastase, gluten, caseine, and many other animal matters, provided they are in a state of decomposition. Light, heat, and electricity, have much influence on these phenomena, and the access of the air is commonly necessary. As instances of the artificial formation of organic principles may be mentioned, that of certain substances having very strong qualities as regards smell or taste, and formerly supposed to be peculiar animal or vegetable products, but which are now artificially formed from certain ordinary substances, as sugar or gelatine for instance. Valerianic acid is such a case, and the flavours of the finest fruits may be produced in a similar manner. Fragrant oils, as those of Spiræa and Gualtheria, may be obtained from salicine and methyle; but in some cases an artificial product may be identical or isomeric in chemical composition with a natural organic element, and yet not present its sensible qualities.

One of the interesting points shown by modern chemistry is, that animals under different circumstances require different principles for their nutriment. Thus the infant and young animal must have phosphates for the formation of its bones, and these abound in milk, their natural food; and the farmer knows that bone is an excellent manure for grass lands. Again, the azotized principles are most nutritious when there is much muscular waste, azote being a necessary ingredient of muscle. As it is thought that no azote is commonly absorbed by the skin, or in breathing, we see that flesh, gluten, or cheese, are necessary for the labourer, as are the gluten and legumine of corn and beans or pulse for working animals, and race-horses are often fed with the last. Again, fat is but one remove from starch or sugar, as we see in the feeding of swine, the formation of wax by the bee, or in the negro from the use of sugar as food.

Liebig has also made it appear that one of the uses of the non-azotized substances, as food, is to furnish carbon to be

acted on, or burnt, as he terms it, in the lungs, and so to produce animal heat. The fat of the body being chiefly produced from such principles, we may see why the carnivorous animal is commonly lean; whilst if the fat, in the herbivora, is not consumed by active respiration, as in the stall-fed ox, the styed hog, or pinioned capon, it accumulates in large quantities in the body. So in arctic latitudes, where the air contains more oxygen in a given volume, where more animal heat is required and produced, and much carbon wanted, the Greenlander procures it in the shape of oil and blubber. Fat is often laid up in particular parts of the body for the use of the respiratory organs, as in the hybernating animal, or as a simple provision against scarcity of food, in the hump of the camel or bison. Like the earth of bones, fat is, properly speaking, an unorganized deposit.

Indolence and sleep encourage fatness, as well as the free use of drinks containing much carbon—alcohol, wine, or beer. Thus we see the publican or Brahmin, or inmates of the harem, given to obesity, whilst with very active habits it is not very easy to become over fat. In disease, when there is increased action in the system and in respiration, with little food taken, the emaciation is always rapid. On the contrary, when there is under- instead of over-action in the body, there is a tendency to the formation of fat; this we sometimes see in anæmia or after hæmorrhage. The use of fish oil in consumption is also a case in point. Liebig would say, that in such complaints it furnishes fuel for respiration, which function in pulmonary diseases destroys the fat and other tissues of the body, and eats away by oxidation the lungs themselves. There may be a difference of opinion on this point, but there can be none as to the use of these inquiries. We may have strong doubts, at the present time, of the propriety of Dr. Good's recommendation of a farinaceous diet for the cure of obesity.

The lungs, and the chemical action going on there, are not the only, and perhaps not the principal, source of animal heat, for, if they were, they ought to be the hottest part of

the body; this physiological difficulty in the old doctrine of animal heat was got over by the theory of *latent heat* of Black, as applied by Crawford, and that in a beautiful manner. But it is now considered that the heat of the body depends upon other chemical changes,* besides the respiratory, which are going on in all parts of it, the waste of muscle and fat, the production of water, nervous action, and so on. Dulong and Sir B. Brodie have maintained that more heat is produced in an animal than the quantity of carbonic acid expired, or oxygen taken in will account for. In fact, the latter sets down animal heat in part to the influence of nervation. In cholera there is an extraordinary sinking of temperature, whilst respiration is going well on, and, after death, when the breathing has ceased, an increase of warmth is observed; similar effects also occur, it is said, in yellow fever; but in the instance of cholera we should suppose, from the coldness of the breath, that there is no true respiratory chemical action, and the coldness of the surface may be greatest during life from the perspirations. The carnivorous animal is as warm as the herbivorous, though he consumes less carbon, his blood and muscular system undergoing a rapid chemical change, which also produces animal heat.

The nitrogenous or quaternary constituents, whether animal or vegetable, albumen, caseine, fibrine, and legumine, although so different in appearance, are, chemically speaking, the same, or nearly the same, with a variable proportion of sulphur and phosphorus or phosphoric acid. Dissolved in a solution of potass, and then precipitated by acetic acid, they all yield the protein of Mülder, and in the first part of the experiment the presence of nitrogen is indicated by the perceptible formation of ammonia (hydrogen and nitrogen), whilst in the second the presence of sulphur becomes evident to the usual test of lead. Gelatine, however, so abundant in animal bodies, does not, like the preceding principles, form protein, nor, like them, become purple by the action of

* And particularly as connected with the changes of lactic acid, by Dumas and Boussingault.

hydrochloric acid; yet it is probably formed in the system from them, and Liebig * points out several possible ways in which the change may be effected; though it is considered that gelatine cannot be *vice versâ* converted into the protein elements, nor, though it helps to compose the tissues, can it be detected in the nutritive fluids. Yet experience has shown, that, as an article of food, gelatine is of great value, particularly in convalescence from sickness. Of the albuminous substances, coagulability forms a remarkable character, fibrine more particularly shows this, perhaps the transition of albuminous matter to organized tissue.

Sugar, starch, dextrine, gum, and fat contain the carbon, oxygen, and hydrogen of the preceding, but not their nitrogen; their ultimate analysis giving water and carbonic acid, both such frequent products of organized bodies, as in the functions of respiration, for instance. Like the preceding elements, they differ much in sensible properties, but in this case are often isomeric, containing the same proportion of constituents. Thus starch and dextrine have the same composition, but starch gives an intense blue with iodine, dextrine a red; starch is insoluble in cold water, dextrine the reverse. A beautiful reason for the latter fact has been pointed out by chemists; in plants we have starch only present, for dextrine would be washed out by the rains; in animals starch must be dissolved to pass into the system, and the saliva and other fluids have the power to convert it into dextrine, as heat or acids have out of the body. A little starch held in the mouth ceases to affect a test as starch, but gives the appearances presented by dextrine. The latter may as easily be converted into grape sugar, which occurs in the body, particularly in one disease, diabetes. Lactic acid also appears to be often formed from these substances.

These constituents, resolvable into water and carbonic acid, constitute then the *pabulum* for respiration, which function eliminates the same products. Oils and fats become

* "Animal Chemistry."

miscible with the fluids either by emulsion, which may be brought about by albumen or certain salts, or by saponification. We have in the body causes sufficient to produce all these changes—oxygen, acids, alkalies, and ferments. But the productions of the body are so numerous and variable, that we must confess it is very difficult to say, in many cases, what particular change or metamorphosis takes place. Liebig and others, with a great degree of hypothesis, have described many probable or possible ones. Thus the elements of urea, carbonic acid, and the bile acid, or the secretions of the kidneys, lungs, and liver, the products of the disintegration of the body, would together constitute the blood or albumen added to those of water and oxygen. Protein oxidized in the lungs would, with earths and alkalies, form the gelatinous tissues, the sulphates and phosphates of the urine and its urea. From gelatine the glycocol of the bile might easily be derived. The elements of glycocol added to those of benzoic acid, with water, give hippuric acid, similar in composition to the biliary compounds, and sometimes found in the urine, particularly after taking the benzoic acid, and in large quantities, in that of the herbivora, displacing in them the more azotized and less carbonised urea of the carnivora, but disappearing when they are hard worked to make way for the more oxidized benzoic. In a similar way we might show how the tissues of the body might be formed, *the formulæ* given appearing more or less probable.

Milk is the natural food of the young animal, both herbivorous and carnivorous, and has been considered as the type of food. Pleasant to the taste, and requiring no cookery, containing all the elements, nitrogenous and non-nitrogenous, with water and salts, and an excess of phosphate of lime, and all the tissues of the body, muscle, nerve, bone, &c., appearing to be ready for formation in it; milk is wonderfully adapted for the use for which it was designed. Caseine is the nitrogenous principle of milk, which however varies much in different animals and at different times; in the first milk or *colostrum*, for instance, under mental

emotion, and from the food or medicines swallowed. In carnivora, the sugar of milk, one of its non-azotized principles still appears, though the animals live entirely on azotized food. The sugar of milk, when acted upon by ferments, produces lactic acid. Caseine differs a little from albumen in its being precipitated by lactic and acetic acid, and not by heat, and by the peculiar property of being coagulated by rennet, the stomach of the calf, as is seen in cheese-making. A similar coagulation is evidently the first step in its digestion, as when milk is rejected from the stomach it is generally in that state. The white colour of milk is owing to the fat or butter which it contains; this exists in the form of globules, which however are thought to be enclosed in a membranous envelope, because when milk is agitated with ether, the latter does not, as it might be expected, dissolve and separate the butter, but only so on the addition of caustic potass, which we must suppose, therefore, to dissolve the envelopes; the lactic acid produced from the milk sugar in the stomach is supposed to have the same power. Lactic acid, no doubt, exists extensively in the system, in the muscles, gastric juice, and in the secretions, but is not easily detected in the blood, passing readily off from it through the lungs, as it is freely resolvable into carbonic acid and water. Lactates, when introduced into the system, are soon found in the urine as carbonates. In rheumatism and some other diseases, it has, not improbably, been supposed to accumulate in the blood, and render it super-acid.

The saliva has one peculiar and remarkable chemical constituent, the sulphocyanide of potassium, readily shown by the beautiful red colour produced by the tincture of steel, most evidently when the secretion is concentrated, and a strong and clear solution of the salt obtained by means of alcohol and filtering, but even in ordinary saliva. It appears to abound most in an active state of the system, after the use of musk as a medicine, or after taking spices, but is less after drinking alcoholic liquors; it is the more curious an

ingredient, as in certain cases the saliva of man and animals has a tendency to become poisonous. The saliva is most alkaline during digestion; besides its salts, it contains other ingredients, particularly an albuminous ferment called ptyalin. Ray observes, "The saliva, notwithstanding its insipidness, hath a notable virtue of macerating and dissolving bodies, appearing by the effect it hath in killing of quicksilver, fermenting of dough, like leaven or yeast, taking away warts, and curing other cutaneous distempers." * It is not difficult to collect separately the secretions forming the saliva; that of the parotid is limpid, the secretion from under the tongue viscous; on which does the remarkable power of the saliva of converting starch into dextrine, and sugar or lactic acid, depend? Bidder and Schmidt attribute it to the viscous fluid, and this certainly appears most copiously secreted after eating bread or swallowing milk.†

The gastric juice, though a limpid fluid, is one of very powerful effect, and of an acid nature, as is perceptible enough when the stomach is emptied by vomiting, or from the extrication of gas after taking carbonate of soda. According to Prout, this acid is, in the adult, the hydrochloric, and there appears to be no doubt on the point, though the lactic and some others appear to be sometimes formed. It is probably equally true, that the acid is secreted from the stomach, and not formed by chemical decomposition of any ingredient of the food, though the constant use of chloride of sodium might seem a likely source of it, and the hydrochloric acid might be set free by the lactic. That it is formed from the general system itself, is corroborated by what has been observed by Dr. Bence Jones, of an alternating alkaline and acid state of the urine, inverse to the state of the stomach. Chloride of sodium, no doubt, performs some important offices in the chemical economy of the system, being generally diffused in various proportions

* "On the Creation."

† In a case of salivary fistula now under our notice, the parotid secretion shows the sulphocyanide as an ingredient.

throughout it, and the redundance being eliminated by the kidneys; by its presence in the serum it may be that the globules of the blood are preserved in their integrity, and it may furnish their base to the phosphates, which, according to Liebig, are indispensable to the function of these globules.* The great powers of the stomach for the solution of aliments are also much augmented by its ferment called pepsin; albumen and gelatine lose their characteristic properties when acted upon by this organ. Water and dilute acids increase the effect of the pepsin; alcohol, alkalies, and the acetate of lead precipitate it, hence the two latter are generally found to lessen the appetite. Too strong an acid stops digestion, as may the alkaline carbonates in excess, so often taken profusely by the dyspeptic. Digestion being analogous in some respects to these semi-organic operations produced by ferments, any strong chemicals, or too great heat, may put a stop to it, whilst, on the contrary, moderate dilution is probably favourable. The stomach has less power over the non-nitrogenous constituents, as starch, than over albumen or fibrine, but it is probable that its acid gastric juice does not interfere with the solvent powers of the saliva, pancreatic fluid, and gastric and intestinal mucus. Fat, too, is not easily acted upon by the stomach.

The pancreatic fluid is not very unlike the saliva, alkaline and containing some fatty matter, salts, and a form of albuminous ferment which is very putrescent; it appears well made out that a principal function of the pancreatic fluid, perhaps in conjunction with the bile and intestinal mucus, is to render soluble or miscible the fat of the food.† The saliva has some small power this way. It also appears certain that when the pancreas is diseased, fatty matter is often ejected from the bowels.

All the constituents of our food are soluble in one or more of the secretions alluded to; the exact action of the bile has

* Some races, however, as the New Zealanders, do not use salt.

† Bernard, Frerichs, Bright. Med.-Chir. Trans., vol. xviii. Yet the pancreas is large in the herbivora, which circumstance would appear to militate against this view.

given rise to considerable difference of opinion. It is said to have a less powerful effect than the pancreatic fluid on fat, though it has been rightly named a liquid soup; the truth probably is, that pure bile has a great power over fat, but then in digestion its alkali often goes to neutralize the acid secretions of the stomach. This decomposition of the bile is attended with the precipitation of some of its own weak acid, which may be named cholic or cholalic, with which its soda is combined. This acid is of the nature of the fatty acids, and appears in the bowels to undergo decompositions, which Liebig has brought about in the ordinary fatty acids, both cases being attended with the same evolution of fœtid gases. It does not appear that the whole of the bile, or even most of it, is discharged with the insoluble refuse of the food, much of it being re-absorbed, the fæces of many animals containing little of it; with it are carried away those noxious principles which it is the province of the liver, as an excreting and purifying organ, to separate, and also colouring matter of a different nature to that of the urine. The bile is also evidently a corrector of putrefaction, as is seen from jaundice, where the stools are very offensive. Besides these uses of the bile, when we consider the position of the liver between the digesting organs on the one side, and the heart on the other, receiving the blood of the former to distribute it to the latter, with an extensive circulation through its own parenchyma, we begin to form an idea of other functions to be attributed to the liver and the bile. It is probably a great blood-making and assimilating organ, and several curious changes and metamorphoses appear to take place, through its agency, in the state of the blood, one of which is thought to be a due supply of principles containing carbon for the oxidation or combustion in the lungs. It is perhaps rather confirmatory of this view that we see fat, a carbonised and inflammable substance, frequently abounding in the liver. In cases of disease it does so in that of man, and normally in that of some animals; it occurs in the alvine discharge, and in the composition of

biliary calculi, as in the natural bile. Bernard supposes fat to be secreted by the liver, when it is not engaged in the act of forming sugar for a similar end. For fat, either amylaceous or albuminous matter, may form the *pabulum*, starch readily fattens animals, as observed before, and muscle is as easily converted into adipocire. The assimilating power of the liver may be diversified in its actions according to the wants of the system, thus whilst in herbivora sugar or starch appears to be often converted into fat, in carnivora, fat or albumen is changed into liver sugar or glucose; their milk contains sugar. This, if correct, shows very different powers in the liver. The emaciation which accompanies diseased liver rather shows that this organ is no eliminator of fat from the system, as has been supposed by many from the nature of its secretions. Bidder and Schmidt suppose an adult man to secrete fifty-four ounces of bile daily.

Like fat, bile contains an excess of carbon and hydrogen, and a deficiency of oxygen. Its analysis in other respects is sufficiently difficult. If we take away its soda, we have cholic acid, though this is not combined with the alkali immediately, but united with two other bodies having less excess of carbon and hydrogen, namely, glycocol and taurine, the former somewhat like gelatine, but without its nitrogen, the latter containing much sulphur. Fat ought to be reducible, according to the theories of the chemists, into bile-acid and sugar, and, with the addition of water, the elements and equivalents are made to be the same; the portal vein must be one of the inlets by which water is taken into the blood. The bile neutralizing the acid in the duodenum, it may be credited that when there is a deficiency or depraved quality of it, a diarrhœa may ensue, in which alkalies or chalk may do good. In Asiatic cholera, really a misnomer, the secretion of bile seems entirely suppressed.

The colouring matter of the bile is, like its other components, a highly carbonized principle, and we may perhaps look for its source in the decomposed colouring matter or hæmatine of the blood, which presents similar tints in certain

circumstances, as in the skin in scorbutus, after bruises, or much vascular action. The principle called hæmatoidin, found in sanguineous effusions in the form of yellowish-red or ruby rhombohedric crystals is considered to be a retrograde form of hæmatine—intermediate between blood and bile pigment. The yellow bile of carnivora becomes green by oxidation, the green bile of the herbivora yellow by deoxidation ; a beautiful play of colours is produced by dissolving the orange coloured concretions, which are found in the gall-bladder of oxen, in a solution of potass, and then adding nitric acid to excess ; and the chemists have furnished us with tests for the presence of bile-acid, or of the mere colouring matter of the bile—in the former case, amongst others, Pettenkoffer's test of sugar and sulphuric acid, in the latter nitric acid.

The blood may be termed an organized fluid, or *chair coulant,* as our neighbours have called it, containing all the elements of muscle and brain, fibrine, fat, phosphorus, &c. Its specific gravity is commonly about 1055, and its fibrine is almost at the point of coagulation, being only kept fluid by remaining in the vessels. It also contains a vast number of flattened globules floating in the serum, which appear to be as much organizations as the cells of the areolar tissue, and like them have commonly central nucleoles. On these corpuscles or discs the colour of the fluid depends. The coagulation of the blood, when drawn from the body, appears to be an act rather of a vital than of a chemical nature, and one proof of this would appear to be the vital operation of those causes which most influence it ; chemical agents have less effect on it than might be expected. When placed under the air-pump receiver, coagulation and separation into clot and serum is somewhat retarded but not prevented, carbonic acid is given off, and the colour is unaltered. Chloroform and hydrocyanic acid hasten the coagulation of venous blood, but retard or prevent its separation, and appear neither to disorganize its globules, nor to change its colour. It is blackened and remains fluid when potass

or sulphuric acid is added, in the former case the globules are disorganized. With nitre the colour is brightened, the serum separates, but there is no solid clot, and the globules appear shrunk. Common salt also brightens it, and prevents coagulation. The separation of blood into the liquid serum, and a clot consisting of the fibrine and colouring matter or globules (and modern chemistry draws a distinction between the two last) is a further process of coagulation. Iron is undoubtedly an essential ingredient in the blood, but it is now denied that its colour depends upon that metal, as it has been separated without loss of colour, yet the chemists show that iron, as it is found in the blood, is peculiarly adapted to receive and part with oxygen, and the colour evidently is much influenced by that addition and subtraction. Sulphuretted hydrogen destroys this power in iron, and has an equally violent effect on blood, showing also, that the oxygenation of the iron, and the bright coloration of the blood are contemporaneous. The blood is alkaline in its nature, and owes this property, according to Liebig, principally to phosphates, and not to carbonates, which however exist there ; these phosphates, from their affinity for carbonic acid, render the fluid well adapted to carry the latter from the different parts of the system to the lungs. Amongst other reasons for the alkalinity of the blood, the preservation of it in the fluid state is an important one.

The carbonates of the blood may be formed from lactates, acetates, and tartrates taken in with the food—they are considered to exist as carbonates, and not as bicarbonates, notwithstanding the presence of carbonic acid in the venous blood ; they combine with superfluous acids, and pass by the kidneys as sulphates and phosphates ; besides preserving the fluidity of the blood, they render its iron soluble, and also the tissues of the body more oxidizable. Though phosphates are present in the ash of the blood, it has been doubted by Rose whether they are not formed during incineration. The carbonates then perform the office of carbon-carriers, above alluded to, which Rose however doubts in the herbivora.

Phosphate of soda is the one of the serum, phosphate of potass that of muscle and of the blood-clot; according to Liebig the former only possesses the power in question, and it must be readily formed by double decomposition from the chloride of sodium in the serum and the phosphate of potass in the clot or muscle.

Many of the changes in the blood from disease will be alluded to hereafter. In scurvy the globules appear to be sometimes, but not always, affected as to form, but M. Becquerel and Mr. Busk deny that there is a deficiency of fibrine. In the land-scurvy now so prevalent, the blood, when drawn, appears thin, but when the clot is separated it has appeared to constitute two-thirds of the bulk, and is tolerably firm, with sometimes a little buff; it is bright externally, but dark within. The incinerated ash procured from the serum gives much more saline matter than is, according to Lehman, yielded by healthy serum, consisting principally of chloride of sodium, with no carbonates. The clot is soluble in a solution of potass, not so in one of citric acid.

We have already alluded to the generation of animal heat in the lungs and system by the oxidation of the food, and the fluids, and tissues of the body, under the form of the elements carbon, hydrogen, nitrogen, sulphur, and phosphorus. M. Barral found that of 6·03 lbs. of food, which he took in twenty-four hours, his excretions accounted for 2·77 lbs., leaving 3·26 lbs. to pass out by the lungs and skin. Of this food 4·39 lbs. were water, of which he parted with 2·59 lbs. by his excretions, and 1·80 lb. must have passed by his skin or lungs. Of the carbon of the food only a small portion passes by the bowels and kidneys, the remainder, 0·74 lbs., remaining to be oxidized in the lungs. Of the hydrogen and oxygen taken in, a small portion likewise is excreted, and then the whole of the oxygen goes to form water with a part of the hydrogen, and passes out by the skin or lungs, as also does the remainder of the hydrogen, but obtaining the necessary oxygen to form water by the lungs; a considerable portion of the oxygen which we breathe, then, may form the

water of the breath. The 0·74 lbs. of carbon (5180 gr.) passes out as carbonic acid, and requires 1·979 lbs. of oxygen to form it. With the quantity previously mentioned, as required by the excess of hydrogen, 2·322 lbs. is the total quantity of oxygen taken from the air in the twenty-four hours, or 617 grains per hour. The total water which is exhaled by the skin and lungs is 2·80 lbs. The total carbonic acid exhaled 2·71 lbs. (7000 grs. to the lb.). The salts and chlorine are not here particularized; and with regard to nitrogen, rather more is taken in than passes out by the excretions, and this is given off by the lungs, which however may absorb it in cases of inanition and disease.

This experiment was performed in winter, when most oxygen is taken in, and the body was supposed to remain stationary in weight, but experiments no doubt would vary much. Other experiments of M. M. Regnault and Reiset have shown that a less proportion of oxygen is consumed in the lungs in the carnivora and in starving animals than in the herbivora, but more in the tissues, such animals feeding as it were upon themselves. Quick breathing animals, as birds and children, cannot fast, and (*vice versâ*) if we consume much food we must be exercised and respire freely. Cold air, too, contains little watery vapour, and more oxygen in a given bulk, to breathe it our diet should not consist of southern fruits, but of the grosser fatty substances which are used as diet in the north.

The air inspired is colder than that expired, and so far must have a cooling effect, as must also the conversion of the water of the lungs into the vapour of the breath, but the gases being of small specific heat, little caloric is lost by their rise of temperature. The aqueous excretion of the lungs, as well as of the skin, must be greatest when the atmospheric pressure is least, and its dryness greatest. In wet weather the air is already saturated with moisture before breathed, but takes up more when heated in the lungs. The comparison of the amount of animal heat produced with the quantity of oxygen taken in, and the quan-

tity of carbon or hydrogen oxidized, has not been well elucidated. The quantity of oxygen in the air (disregarding the carbonic acid), appears to be about 20·9 by volume; the carbonic acid forms on an average about ·04 per cent.—in the expired air the latter becomes between 4 and 4·5 per cent., but varying of course in different states of the system. Valentin believed that the disappearance of the oxygen, and the exhalation of the carbonic acid, correspond pretty accurately as to quantity with the law of mutual diffusion; he also found that his body, weighing 119lbs., gave off, on an average, 604 grains of carbonic acid per hour, whilst the oxygen taken up amounted to 520 grains, that is, rather more than 5 grains of carbonic acid given off, and more than $4\frac{1}{4}$ grains of oxygen consumed, for every pound of weight. Most carbonic acid is given off in a robust and active state of body; in females when menstruation is deficient, or in pregnancy. The skin rather exhales watery vapour than carbonic acid or any other gas.*

A remarkable production of that chemical action in the tissues above alluded to, is the substance called urea, first detected by Rouelle, which may be demonstrated in the blood, &c., but which abounds in the urine, and which leads us to the chemistry of that fluid. Another curious principle originally discovered by Chevreul exists in the blood, but particularly in the muscles, called kreatine, nearly allied to urea. The kidneys are the principal emunctories of the body, and in their secretions are conveyed out of the system its surplus azote and salts.

The urine varies in different circumstances. After meals it is much influenced by the nature of the food, either by directly transmitting some of its principles from the blood, or by relieving the system of others, which may be natural to it, but which are being augmented too much by the digestive organs. Before food it is an index of the state of the blood. It is plentiful but watery in cold weather, its secre-

* Valentin, op. cit. Dr. Bence Jones's excellent Lectures in the "Medical Times."

tion being vicarious with that of the skin ; on the contrary, it is scanty and thick after copious perspirations, having insufficient water to dilute its constituents. It is remarkably copious and limpid in a perturbed state of the nervous system. When healthy it is generally acid, and turns vegetable blues red, which, however, the uric acid does not, and therefore it is supposed to be from some free lactic or phosphoric acid ; but when the urine stands exposed to the air, its animal matter acts as a ferment, and it becomes alkaline, the highly nitrogenous urea being decomposed and ammonia formed. Of this urea there are commonly about 30 parts in 1000 of urine. It contains also in less quantity uric acid, which was first discovered by Scheele, and is much less soluble, and becomes precipitated when in excess ; lactate of ammonia and animal matters ; and salts of which the alkaline ones are never precipitated on account of their solubility, but the earthy phosphates often. The colouring matter of urinary deposits, according to Prout, a purpurate of ammonia, is one of the most beautiful of colours, and is different from, and apparently, in some respects, the reverse of, in its chemical nature, that of the bile. The colouring matter of the urine itself abounds in febrile and dyspeptic states of the system ; it has been termed uroxanthine, and one form of it murexide. A similar pigment together with urea and a kidney may be traced down to animals rather low in the scale, as the acephala. The sepia and purpura have separate reservoirs for their colouring excretions. According to Valentin all animal colouring matters are essentially carbonaceous.

When uric acid abounds it must, as observed above, be precipitated as gravel. In all such cases chemistry comes to our aid. This circumstance occurs in an acid state of the system, in gout for instance, and if we administer alkalies we correct it, or at least this important symptom. Urates of soda, lime, or magnesia, are however much more common, and are deposited in fevers, indigestion, and slight derangements of the system, showing themselves as the liquid cools.

From their solubility they have not the interest of uric acid deposits. These, as well as urea, are eliminated, but not formed, by the kidneys. A deficiency of urea shows a state of the system in which there is inaction of the assimilative chemistry of the body. Xanthine or uric oxide appears to be allied to urea.

Water must be a good preventative of uric acid deposit; and Rhenish wines are said to be so from the tartrates which they contain. A noted popular solvent of stone, of the present day, called "constitutional water," is a solution of pearlash, and in one case we have known an ascertained vesical calculus to be apparently dissolved and broken up under the use of that salt, the previous violent symptoms disappearing after the passage of much *detritus*, though the fact has certainly not been verified by a second sounding. A small uric acid calculus, placed in a solution of pure potass, and kept at the heat of the body, being occasionally shaken, soon dissolves. Lime water is also a powerful solvent, though less so than the alkali, and a solution of the carbonate of potass rather less still when out of the body; phosphate of soda and Rochelle salt have no effect. Phosphates and borates have been strongly recommended as lithotriptics. Exercise causes uric acid to disappear, and urea to be produced, by promoting a more complete oxidation, but if the latter action is insufficient the still worse oxalate of lime, which forms what is termed the mulberry calculus, may be produced. This last deposit has also been attributed to the use of water containing the lime with which the acid combines so strongly, and also to the presence of oxalic acid in the food. The earthy phosphates can never be precipitated in the natural acid state of the secretion, and the sulphates found in the urine are never insoluble, and cannot form a calculus; uncombined sulphur is sometimes present in the urine, and forms the characteristic constituent of the rare cystic-oxide calculus. It is believed that sulphates abound in the urine in such diseases as are marked by violent action of the muscular system, and the

same remarks apply to the phosphates and diseases of the nervous system. In certain states of the system the urine becomes alkaline; thus the lining of the bladder may become inflamed, and generate a ferment, or at least a cause, for the decomposition of urea, and the formation of ammonia takes place: filtered urine does not readily become putrescent. If we counteract this alkalinity by the suitable chemical medicines the phosphates cannot be deposited; if we do not, this must occur. The seeds of gramineæ and other portions of our food contain phosphate of magnesia, and this, if taken into the system, and if it meets with ammonia, must give rise to a deposit of insoluble triple phosphate. The urine of herbivora is normally alkaline from the existence in it of earthy carbonates, to be seen in curious microscopical crystalline globules.

In that singular disease, diabetes, there is a great quantity of a peculiar sugar in the urine, attended also with a very increased flow of the excretion. As observed before, sugar is a normal production of the body in a state of health, in the stomach, liver, and in the milk, and lactic acid or gelatine might also be easily changed into it. But what chemical fact throws light on the disease? Is the liver, as Mead believed, the organ at fault, or the stomach, or kidneys, or the innervation? Or is the sugar of the liver not properly oxidized by respiration into carbonic acid and water? Sugar is sometimes found in the urine of old people, and also of those who have inhaled for some time chloroform. It has been detected in the blood of diabetic patients, though Wollaston and Henry failed to discover it. The complaint has not ceased when sugar, starch, and even all vegetable matter whatever has been withdrawn from the food. Acidity of the system often attends the disease, and alkalies appear to lessen it by facilitating the change of the sugar, as we see in our tests for it. One of Mead's remedies was alum-whey, and he attributes the disease in many cases to drinking large draughts of cold water after fits of intemperance.

We occasionally have the presence of albumen in the urine, in the disease called albuminuria particularly, but also in erysipelas, pneumonia, variola, after blistering, &c. It, as is well known, may be easily detected by heat, and the phenomenon shows us the existence of disease in organs otherwise much withdrawn from our observation. Exposure to cold may check the natural transpiration of the skin, determine it to the kidneys, and cause their inflammation and attendant albuminous secretion from over action ; the dropsical state which also ensues appears to be dependent on their lesion. Similar symptoms occur after scarlatina or measles ; it is generally considered that this occurs from a poison having to be eliminated by the kidneys ; others suppose the skin to be the organ primarily at fault ; it does not appear that those cases where the eruption is strongest are such as present us more particularly with the albuminous or sanguineous urine.

In some cases when the urine is not efficiently secreted, the urea is left in the blood, poisoning it, and producing serious effects, particularly on the brain. Urea appears in such cases to pass out of the body, to some extent, by the breath, which becomes ammoniacal.

There is much of interest attached to the analysis of the urine and its deposits. Prout, Wollaston, and Marcet, were amongst the first who directed their attention to it, and chemistry has now thrown much light upon physiology and pathology in this as in other respects. Modern chemistry, too, has pointed out admirable modes of ascertaining the different states of the urine, morbid or otherwise. The presence of albumen is, as already observed, beautifully detected by heat, but the deposit which appears might be composed of the phosphates, in which case a little nitric acid redissolves it. The presence of sugar may, amongst other tests, be ascertained by fermentation of the urine by means of yeast, or by boiling it with potass, when a brown colour affords evidence of its presence, or by Tronmer's beautiful test of excess of potash, a little sulphate of copper,

and the application of heat, when the bright reddish colour immediately produced shows its presence. The diurnal *per centage* of sugar must be told by the specific gravity, or by Soleil's method of the rotation of the plane of polarization, or by what Valentin recommends after Fehling—dropping the urine into a solution of sulphate of copper, with tartrate of potassa and soda of a known strength, till no red precipitate any longer forms. A little pure nitric acid added to the urine in a watch-glass, shows by its crystallization the presence of an excess of urea, and of a too rapid oxidation and disintegration of the body. A minute portion of blood in urine becomes evident by its change of colour on the application of heat, and by a degree of coagulation. If nitric acid produces a brown deposit in urine, it is uric acid. If the urine contains an excess of colouring matter a few drops of hydrochloric acid will probably change it to dark red or purple. In the above cases the urine is supposed to be clear and acid. If it is alkaline and has a sediment, add a little nitric acid, and if a white sediment still occurs it is albumen; if brisk effervescence follows the addition, carbonate of ammonia has been formed from the urea; if there is a flocculent deposit, easily diffused by agitation, it is the natural mucus; if it is ropy and apparently viscid, and a drop of nitric acid dissolves it, it is composed of the phosphates. A white, brownish, or reddish deposit disappearing when the urine is heated, consists of the urates—a reddish one occurring in acid urine, consisting of particles like cayenne pepper is more important, being uric acid; it is soluble in alkalies, and, evaporated with nitric acid, presents the rich tint of purpurine. A deposit insoluble in acetic, but soluble in hydrochloric acid, and giving a white precipitate when neutralized by ammonia, is probably oxalate of lime. Cystine dissolves in ammonia with an aromatic odour. The microscope also detects the corpuscles of blood or pus, and the peculiar crystals of uric acid (spindles), the phosphates (prisms), and oxalate of lime (octahedra), in a ready way. Kreatine is also best detected by this instrument.

The industry of chemists has also been successfully applied to the analysis of calculi, but we trust that enough has been said to prove the close relation of medical science with the interesting discoveries of chemistry.

CHAPTER IV.

Pathology—Apology for the different opinions which have been held with respect to the nature of diseases—Progress of our knowledge of medicine—The classification of diseases, their natural history, proximate causes, and indications of cure—Sthenic diseases, inflammations, epidemics, contagions, exanthemata, morbid poisons—Contagious and non-hereditary diseases.

We are not now about to compose a treatise on the diseases of the human body; it may perhaps be considered presumption enough to attempt even a sketch of their natural history and arrangement, of as much as is known of their essential nature, and an epitome of the general indications of cure, enough to enable us to judge of the present acquirements and deficiencies of our art.

It has been written that medicine is a science of guessing, and that "it has been more professed than laboured, and more laboured than advanced," and that "this labour has been often in circles, and not in progression," yet we must maintain, that since Bacon's time, and particularly in the present century, these observations do less apply. In our own days how many improvements are taking place in medicine. Much light has been thrown on diseases of the heart and lungs by the stethoscope,* on head affections, on diseases of the kidneys and dropsies, on the morbid anatomy of diseased structures and tumours, and valuable additions have been made to the *materia medica*, as evinced in the discovery of iodine, chloroform, and the alkaloids.

In some respects, certainly, the most ancient of physicians was one of the greatest; since he was a true observer of his "nature," and her "powers." The necessary consequence of this doctrine appears to follow in that of crises; but other tenets which have been attributed to Hippocrates may not in reality belong to him, but appear to have been later additions of the dogmatical school, suppositions attended with a variable *quantum* of truth. Such doctrines of atoms, numbers, elements, humours, constriction, and relaxation, &c., have in all ages been the progeny of one form of the human mind applied to medicine, the methodic or systematic, the opposite to that empirical turn which would observe all facts but explain none. Another tendency still is to be seen in medical philosophy, to mount from matter and the body to spirit; to leave what we may understand, but which does not satisfy our curiosity, for what we wish to know, but which is above our reach; a principle which the historians of our art tell us influenced some of the eclectics in ancient medicine, as well as the vitalists amongst the moderns.†

We have previously mentioned the reason which authors

* Hook appears to have seen the use which such a conductor of sound might be to the ear in the detection of disease.

† Heberden, in his Commentaries, makes some observations on this subject.

assign for the decadence of the healing art in the first centuries of Christianity. Even Luther was not free from the doctrines of the divine infliction of diseases, and of their cure by supernatural aid.

In the ages of mediæval darkness, however, and from the mistaken researches of alchemy, originated a science destined to throw much light upon medicine—chemistry. The alchemists naturally conceived a scorn for the Galenists, though Van Helmont did not ignore the existence of a presiding vital force or *archeus*, which indeed was the case also with Paracelsus.* In our own country a species of medical fanaticism arose, of which Fludd, Digby, and Greatrix were curious examples.

The truths of natural philosophy, also, now began to be elucidated, and the doctrines of ebullition, combustion, fermentation, and inspissation, of atoms and pores, combined or not with the chemical doctrines of acids and alkalies, and countenanced by the discovery of the circulation, and the researches or writings of such men as Borelli, Pitcairn, Wintringham, Mead, and Hales, became prevalent.

But it was soon found that animal tissues and vessels are only partially ruled by the laws of natural philosophy, and reducible to its problems. The philosophic Sydenham was one of the first to oppose this school,† and the spiritual system again had a remarkable supporter in Stahl, with his *vis medicatrix naturæ*. Hoffman upheld similar doctrines, and the illustrious Boerhaave did not discard them, though, like many other true philosophers, he rather sought to lay hold of something more tangible in the mechanical and chemical doctrines.‡ Van Swieten's work added lustre to

* Paracelsus commenced his professorship by burning the works of Galen. According to Cabanis he used to exclaim, "Arrière moi, Grec, Latine, Arabe!"

† The writings of Whytt and Willis had a tendency to direct the attention of the physician to the inherent and peculiar actions of animal bodies.

‡ When attacked by his last illness Boerhaave wrote the following letter to a friend, in 1737, which we transcribe from Mr. Pettigrew:

the labours of his master, and he was followed by the practical De Haen. The scarcely less illustrious Cullen was still more a vitalist; spasm, constriction, relaxation, and the vital force, are important agents in his "First Lines," in the introduction to which we have, as observed before, a sketch of medical doctrines to his own times, which must interest a student of intelligence and taste. Solidism in preference to humorism, was also the doctrine of Baglivi and Glisson.

Montpellier has had the distinction of producing several noted supporters of the doctrine of the vital force. In England Darwin called attention to the different systems of functions, the nervous, vascular, contractile, &c., and especially to the relations and associations of each with the others. Still later Dr. Parry has shown the extensive applicability of the doctrine of determination of blood to many diseases, particularly to those of the nervous centres.

It is certainly rather humiliating to survey the above varied opinions upon disease: it may be noticed, however, that the difference of doctrine has always reference to the nature of the disease, or what has been called the proximate cause. This is no true cause at all, nevertheless it constitutes a legitimate, though difficult matter for inquiry. There is probably a degree of truth in many of the above doctrines, but error has too often arisen from faulty generalization, false analogy, and from forsaking the proper field of philosophical inquiry—*facts* and their *true sequence,* for vague and remote spiritual causes. Influenced too much by dogmatic views, "idols of the theatre," we are apt to pay too little attention to symptoms, and to forget that present relief must be one of the maxims of medicine. On the other hand, the

"Me prehendit vomica in pulmone, spiritum præfocans ad levissimos corporis motus, a tribus abhinc mensibus quotidie increscens. Si causa augetur, opprimet, si vero rumpitur eventus incertus. Quicquid fiet, id omne continget ex arbitrio superioris numinis. Cur ego metuam, quid cupiam aliud! Adoremus Deum! sufficit. Interim curo sedulo ut lectissima adhibeam remedia, ut leniam et maturem, securus de exitu. Vixi ultra, 68 annos, semperque lætus."

empirics and experimentalists should not forget that the acknowledged sources of fallacy in medicine—fallacies relating to testimony, or depending upon too great a deference to authority, imperfect talent for observation, or credulity, or such as arise from the idiosyncrasies of the patient, particularly apply to their method of investigation.

Though the iatro-mathematicians have often excited the ridicule of the wit and the poet, and though there is no reason to suppose that the liver or kidney is a mere mechanical filter, and as little that excess of acid or alkali is the primary cause of fever, yet microscopical researches and chemical views of disease are not losing ground. With respect to the Stahlian doctrine of the *vis medicatrix naturæ* it was modified by the great and admirable Hoffman ; Stahl's error lay in the personification of it. It has been observed, that there is as strong a tendency to death in the system, particularly in disease, as to life, but this appears to us to be a fallacy, at least not to disprove the *vis medicatrix ;* the cause originating a disease, a miasm or contagion for instance, or the disease itself consisting in a blood poison, or malignant tumour, may be invincible, and pretty certainly lead to death ; and there is a natural tendency in the body to undergo after a time, in old age, a regular process of decay ; but all this cannot be set in opposition to the principle for which Stahl contends, which is a reality both in health, warding off mischief or providing for it, and in disease showing resistance to it,—a fact admitted by almost all physicians, and arising perhaps from that law attached to living bodies by which they are constantly growing, changing, and renovating their tissues ; and also from that sympathy and harmony which exist between the different organs of the body, so that any disorder of one part is perceived by another, or by the whole system, and a train of action set up by which a cure is accomplished, in some way, or by some outlet. It is as evident that the system has a power to resist disease as it has to maintain its health amidst numerous deranging causes.

In some respects the popular humoral pathology appears a natural view, and comes near to the truth, vague as it is in other respects. Certain chemical diseases, vital ferments, the metastases or repulsion of cutaneous and other diseases, and critical evacuations, are considered arguments in favour of the doctrine.

The doctrine of vascular spasm of Cullen was severely handled by a less worthy man, his *quondam* friend.* Brown's doctrine of sthenic and asthenic diseases, and of a lowering treatment for the one, and a stimulating one for the other, had probably eventually no bad effect on our art, though his "Elements" are a curious instance of rash systematizing and generalization. A multitude of diseases, scirrhus, epilepsy, or diabetes, for instance, are necessarily thrown overboard in his system, and his physiology is as defective as his pathology.

An objection to Dr. Parry's view of determination of blood has been taken on the supposition that the heart must distribute the blood equally in all directions. It has been shown, however, that the middle and smaller sized arteries are best supplied with nerves, and they probably are the efficient causes of determination of blood, being stimulated to increased action according to the state of the part through the nerves of their strong muscular coats.

But whatever opinions may be formed with respect to the received principles of medicine in general, we can have but one, and that of a favourable nature, with respect to the practice and results of manual medicine or chirurgery. Surgeons may triumphantly appeal to the statistics of their art, which show that their treatment is most successful, and that even the capital operations of surgery are accomplished with the best result. Heberden once wrote with respect to one of these, that for hernia, "the operation of dilating the ring with a

* "Observations on the Principles of the Old System of Physic," by a gentleman conversant on the subject, 1787 (Brown?). Cullen's doctrine of independent action of the pores, their spasm, &c., is countenanced by the effects on them of faintness, fear, nausea, or approaching death.

knife, and by that means freeing the gut from the stricture by which it is supposed to be strangled, is, as far as I have observed, very rarely, if ever, advisable." Yet by this simple operation patients are now daily saved from certain death, or from what many would consider worse, and want of success in the operation is certainly the exception and not the rule ; and so of lithotomy, the ligature of arteries, extraction of the cataract, and amputation.

The history of chirurgery would probably include more interesting matter than that of any other department of medicine. So dependent is the art upon a knowledge of anatomy, that it could only arise at the birth of the latter, at the close of the dark ages. What degree of perfection without practical anatomy surgery could attain (and it was more than could be anticipated), may be seen as it existed in the Roman empire, and as made known to us in the writings of Celsus, Aëtius, and Paulus Ægineta, the last of whom flourished as late as the eighth century. Amongst the Arabs surgery appears to have been marked by its greatest failing —cruelty, and, as a natural consequence, it afterwards fell into disrepute, being at this era only practised by the Jewish race, by monks, and by itinerants of all sorts. The church, about the twelfth century, interfered with the clergy's practising surgery. Some operations, as that for the stone, were even thought degrading, and were left to particular itinerants, perhaps looked upon in scarcely a better light than executioners amongst us. Such were Frère Jacques and the ecclesiastic St. Come. In the fourteenth century Guido de Chauliac in France, and John of Arden in England, may be considered to have introduced the art into their respective countries, in France a College of Surgeons having been founded some time before. In our country surgery rather degenerated than progressed ; France, always a great military nation, saw its importance, and her armies were followed to the field by the celebrated Ambrose Paré. Though he was not the inventor of the ligature for stopping hæmorrhage, yet he re-introduced it, never again to be forsaken for

styptics and cauteries. He was, like his contemporary Palissy, a conscientious Protestant, and both were saved from the horrors of St. Bartholomew's by the personal protection of the French king. After Paré, Wiseman and Pott in England, Hildanus and Heister in Germany, Severinus in Italy, and Petit and Desault in France, led the way to those great men who are our immediate predecessors in the art.

During the last quarter of a century a variety of improvements of the greatest importance, and all on the side of humanity, and (what has been termed) conservative surgery, have been introduced—lithotrity, the excision of diseased joints instead of amputation, the cure of aneurism without operation, the excision of diseased bones (a proceeding which we principally owe to the Edinburgh school), the division of contracted tendons by subcutaneous, bloodless incision, and the cure of distorted limbs thereby (an invention of our Saxon neighbours), the restoration of lost parts, the safer operation for hernia without interfering with the sac, perhaps the section for ovarian dropsy, and what renders all operations easy to the patient as well as the operator—that blessing of heaven, chloroform.

The diseases of the human body constitute an endless series, but we trust that, with regard to many of them, like the ills of Pandora's box, there is hope at the bottom. Nosology may be called the natural history of diseases, and it is difficult to enter into their study without some such methodic arrangement; and yet such classifications can only approach towards perfection, as we become more intimately acquainted with the real nature of disease. Nosology, as is the case in a genuine and natural arrangement in botany or zoology, should make us acquainted with the objects themselves. It indeed appears to have been introduced with the classifications of natural history, the offspring of Linnæus and his school, in the last century: that of Sauvages, one of the first, is perhaps one of the best. All arrangements are attended with difficulty, and that of diseases in particular. Probably those systems of nosology

which are least methodic, are the most correct and natural; the arrangement into families, for instance, is less arbitrary than that into classes and orders. But many diseases cannot be arranged from natural resemblance, and more arbitrary and artificial differences must be used, as they affect the body generally or locally, or with respect to any particular system of functions, or as they are attended with inflammation or not. In natural history variation occurs under the operation of one law alone, that of vital growth; in disease there is a derangement of this law from a variety of causes, and affecting various parts and functions. Nosological classification then appears somewhat like that which mineralogists are obliged to adopt, derived from a variety of qualities of a different nature in the objects of their study.

Physiology is of the most general use in the arrangement of diseases, and is extensively applied, almost exclusively, in the system of Dr. Mason Good: yet even physiology is not sufficient to point out to us a natural classification. Fevers or inflammations can scarcely be so arranged, nor yet scrofula nor syphilis. Neither would an anatomical arrangement always hold good. Hooping-cough and bronchitis affect the same parts, yet it is questionable whether they should be arranged together, the first originating in a peculiar way, by contagion. Inflammations of various organs may, on the contrary, be naturally placed together, notwithstanding the difference of the parts affected. Apoplexy is commonly a hæmorrhage, yet in this case the disease is separated from other lesions of the circulation on anatomical and physiological grounds, as well as from the importance of the part affected. To treat of diseases as some authors have done, as they occur *a capite ad calcem*, though it may be a convenient mode, is a going back to the dark ages of our art.

Sthenic Diseases, or those of Over-action.—Pyrexiæ of Cullen.

Local, or Inflammations.—Phlegmasiæ of Sauvages.

INFLAMMATION.

Inflammation may often be considered as an exaltation of the natural organic power, a curative process, set up for some good end in the system, to heal a wound, unite a fracture, or effect the discharge of a poison or irritating object, or as caused artificially by the surgeon to cure other diseases. But though in this aspect it is often beneficial, yet may it, not rarely, prove of injurious or even fatal tendency, abscess or mortification also sometimes ensuing.

Celsus observes, "*Notæ inflammationis sunt quatuor, rubor et tumor cum calore et dolore.*" But inflammation, when of any extent, is also attended with another interesting phenomenon in the blood. Ordinary blood when drawn from the veins coagulates, with the separation of its serosity from the clot, a phenomenon which is probably a vital act, and does not often take place in the blood after the vitality of the system has been totally and suddenly extinguished, as in death by lightning, asphyxia, &c. Neither variations of time, nor of heat or cold, the state of rest or motion, nor the access or withdrawal of the atmosphere, determine, though they may influence it.* In inflammation, which is an exaltation of vital action, coagulation takes place in the tissues to a greater degree than usual, and in this case too we have the peculiar appearance alluded to, the clot being seen to consist of two distinct parts or layers, a mass of red globules at the lower part, and at the top a stratum of fibrine, called the buffy coat, the upper surface of which is marked by a concavity or cupping, from what appears to be most like increased vital contraction. It is probably from this strong tendency of the fibrine to contract, that its isolation into

* A quantity of extravasated blood was let out from the back of the hand, where it had remained for some time in the fluid state. Though much altered in its appearance, it soon coagulated when out of the body.

the buffy coat takes place, the vital contraction of its particles producing a similar effect to what may occur in other fluids or solids from chemical or physical laws.* The blood-discs too have a strong tendency to cohesion in the form of *rouleaux*, and they so form the lower part of the clot by their aggregation and weight. The buffy coat, though it occurs in some other states of the system, when the vital plastic actions are great, as in acute rheumatism, or pregnancy, is a sign of inflammation which seldom deceives.

This plastic and coagulable lymph, or fibrine, appears to be a provision in the blood, ready to be poured out in nutrition or inflammation, and it evidently sometimes prevents the most disastrous consequences, as in the case of a wound into a synovial or serous cavity, when it effects immediate closure, and prevents dangerous results.

ABSCESS.

Inflammation may be stopped at what is called resolution, and then the lymph thrown out is absorbed. If inflammation tends to suppuration then the lymph has already formed a barrier to prevent diffusion of pus, and to confine it to one focus. Abscess may occur when the injury is great, or when some foreign body or noxious poison is to be expelled, or from other unexplained states. In this case a very different action is set up, and the peculiar product, pus, is formed, itself apparently a semi-organized fluid, and capable in many cases of generating the same: it consists of globules floating in a serous fluid, but different from those of the blood, being somewhat larger and rather granular in appearance, yet one would almost suppose, with Gendrin and

* Hewson explained this phenomenon on the supposition that the blood in inflammation coagulates slowly. Davy, Gendrin, and Stokes, deny this, though the buffy coat may be prevented by causing the blood to coagulate rapidly, as is well known. Mr. Simon supposes the fibrine to appear as the result of a disintegration of the blood, an opinion in which he is perhaps singular.

Donné, formed from some morbid change in those of the blood.*

We are not left without a guide by which we may judge whether suppuration is taking place; we may have throbbings in the part from the strong arterial action, but shiverings are the characteristic indication. These appear to be, in many cases, a symptom of increased action or effort in the system; they accompany fever, digestion, and the labour pain. That pus may be often absorbed is certain, as is seen in cases of hypopium or suppuration in the anterior chamber of the eye. Absorption also is probably going on constantly in many large chronic or cold abscesses, and it often appears better to encourage this, than to run the risk which ensues on opening them.

ULCERATION.

On the skin and mucous membranes, and occasionally on internal surfaces, as in the joints, or on the surface of the brain, the process called ulceration rather than suppuration is apt to occur. This is often no doubt a process of slow gangrene, but sometimes resulting, as Hunter taught, from a preponderance of the absorbent vessels over the nutrient, the affected part being absorbed, to be perhaps again generated slowly, under more favourable circumstances. Weakness of the circulation in a part, or the existence of a morbid poison in the system may predispose to inflammation becoming ulcerative in its character. In some cases ulceration appears to proceed quite independently of inflammatory action.

GANGRENE.

Is a part too much injured for its life to be preserved, is the circulation much impeded in a limb, is inflammation

* Mr. B. Cooper showed that the pus of abscesses leading to diseased bones contains an excess of phosphate of lime, the bone being evidently dissolved in it.

inordinately high, the system in a very unfavourable state, or the atmosphere loaded with putrid effluvia, the various forms of gangrene may take place. This may happen in some instances without inflammation, as when the artery of a limb has become ossified in an old subject, but the latter is always necessary to separate the dead from the living parts. The onset of gangrene is in some cases attended with great inflammation and distress, but when fairly determined pain ceases.

The action in inflammation must be one of the vascular system especially, yet no doubt it is preceded as well as caused by a disturbance of the nervous power on which vascular action depends. This nervous power must be that of the nerves of organic life, distributed to the arteries, and which are, in the case of a limb, probably supplied to the vessels from the common nerves, with which they have been united at their roots. Such a disturbance in the nervous function, which, if we deny the existence of, will render the causes of many inflammations unintelligible, may be produced by some local cause in the part itself, as a mechanical injury, or by some constitutional disturbance, as a fever. But the vascular action is most cognizable to our senses; no doubt the vessels going to the affected part become excited, and the circulation is, at first especially, increased from their independent action, though the rhythm of their pulsations continues always synchronous with that of the heart; the small vessels afterwards enlarge, apparently from indirect atony, the blood discs stagnate in places, serum and lymph, or even the red portion of the blood, is extravasated, and we have then established those phenomena of inflammation before enumerated.

SPECIFIC INFLAMMATION.

But the simple process of inflammation seems to vary in some respects in what is called the specific: yet it must be confessed that, as far as we know, this specific character is

rather seen in the degree of it, its course and results, than in any difference of the inflammatory action itself. The nature of the structure affected does not appear sufficient to account for these peculiarities, though particular specific inflammations affect particular parts.* Gouty or rheumatic inflammation has no tendency to suppurate; scrofulous suppuration, and syphilitic ulceration, are equally peculiar, and it is evident to our observation that inflammation of the skin or eye presents various characteristics according to its specific cause. Many of these specific inflammations depend upon very different conditions of the system, often anything but states of healthy tone, and requiring opposite modes of treatment.

The indications of treatment of healthy inflammation appear plain—the removal of the local cause, or the rectifying the particular state of the system, on which it depends, the lessening of the flow of blood in the part, in various well-known ways, by evacuants, position and the application of cold; the moderation also of the sympathetic fever, to be mentioned hereafter.

But when resolution is hopeless we at once encourage suppuration by a better diet, and warm epithems topically; and though, by a beautiful provision of nature, pus strongly tends to the surface, and will probably finally reach it, even when only separated by a delicate membrane from some interior vital organ or cavity, yet in certain cases the bistoury of the surgeon is, in reality, safer than the process of nature.

In gangrene nature and the constitution are playing a losing game against the disease. The period for depletion is brief, and the flagging powers of the system must be aided by a bold plan of supporting and strengthening; bark, wine, and particularly opium, constitute our anchors of hope, and they appear to have been often successful in saving life.

* Thus, rheumatism affects the sclerotic, syphilis the iris, scrofula the cornea, catarrh the conjunctiva.

INFLAMMATIONS OF MUCOUS MEMBRANES.

In these membranes inflammation has some peculiar characters. Thus the cause of some of them may depend upon that sympathy with the skin, which arises from the exhalations of both being in some measure vicarious; thus we have a bronchitis from suppression of perspiration, and the same, or pneumonia in an extensive burn or scald; and later in the case inflammation of the mucous membrane of the digestive canal. And it is partly from this common origin that Dover's powder and diaphoretics prove useful in these diseases. Mucous inflammations too are less benefited by depletion than others, in fact, stimulants and astringents have often a remarkable effect on them, vascular relaxation appearing to be an early result. Thus we use balsams in bronchitis, opiates in muco-enteritis, and metallic astringents to the other mucous tissues, even that of the delicate eye.

Some mucous inflammations may be produced by a local irritating cause, as cystitis from the presence of a calculus in the bladder, or of an excess of uric acid in the urine, as occurs in gout, but probably more frequently from the decomposition and ammoniacal state of that secretion.

SKIN DISEASES.

The skin is somewhat analogous to a mucous membrane, complicated in its structure, and its diseases very diversified, and, as to the particular element of the part affected in them, probably ill understood. We have simple diffused inflammation of the skin in erythema, attended with desquamation, and when it amounts to erysipelas the subjacent areolar tissue is affected, and the cuticle often elevated in serous exudations or bullæ. True scaly diseases of the skin appear to be often the result of a hypertrophy or chronic inflammation, and of some morbid taint in the system; psoriasis and lepra are often hereditary, and this class of skin diseases is apt to occur in individuals whose integument is of coarse organization. Other skin diseases may consist in inflamma-

tions, vesicles, or suppurations in the papillæ, sweat glandules, sebaceous crypts, or hair follicles, but we leave it to the dermatologists to pronounce on the nature of each.

Aphthæ is an eruptive disease of the mucous membrane of the mouth, frequently extending inwardly to the anus, occurring in the infant from derangement of the mucous membrane of the stomach and bowels, conjoined with the irritation of sucking, or of hot or improper food; or in the adult, as in consumptive cases, from the derangement of the bowels conjoined with the frequent use of sapid substances; also in cases of paralysis of the face and tongue. Aphthæ and many cutaneous eruptions are attended by the presence of dermatophytes or microscopical forms of algæ or fungi.*

INFLAMMATIONS OF SEROUS MEMBRANES.

The office of serous membranes is principally to facilitate motion. They curiously enough appear to be more liable to inflammation than the viscera which they cover. They are extensive secreting and absorbing surfaces also, and therefore sympathise with the skin, and are easily affected by cold and suppressed perspiration. Drs. Christison and Coindet found that four ounces of a fluid injected into the peritoneum of a cat disappeared in a very short space of time. The synovial membrane of the joints is liable also to injury from violence.

Increased flow of mucus, and then the formation of pus, is the result of mucous inflammation; in serous there is very soon effusion of serum. This serum sometimes contains much fibrine, and when drawn from the chest by paracentesis it may sometimes be seen to coagulate spontaneously as soon as drawn. False membranes readily form from this fibrinous matter in serous inflammation, in many cases, evidently, a beneficial provision of nature; in violent cases pus is also formed.

* Robin and Gruby. Dr. Parkes gives a compendious analysis of their observations in the Med.-Chir. Rev., October, 1853.

MENINGITIS.

Local injury, insolation, mental excitement, intemperance, general pyrexiæ, or distant visceral irritation, may cause inflammation of the membranes of the brain, the phrenitis of authors ; as cold or excitement of the circulation or respiration may that of the serous membrane of the lungs.

PLEURITIS.

In the latter case we can surely discover the existence of serum or pus, when the complaint has gone on to effusion, and by drawing it off by paracentesis restore the displaced heart to its normal position, the lungs more or less to their proper office, and the sides of the chest to equal expansion.* Pus in the thorax or empyema is the result of local disease, and drawing it off has often restored the patient to perfect health, so when the serous or fibrinous effusion is not an effect of cardiac disease, but of pleuritic origin. In other cases of hydrothorax the operation is merely a palliative. In children the fluid may be absorbed by the use of proper remedies, and the perfectly displaced heart has returned to its normal position.

PERICARDITIS.

Inflammation of the pericardium or heart-bag, as well as of the lining membrane of the heart, has deservedly obtained serious attention in modern times, as it is not unfrequently found to be a very dangerous attendant on acute rheumatism, particularly in the young. This remarkable complication must arise either from the membranes of the heart being structures liable to that species of inflammation, or perhaps from the great arterial action, which appears to be the cha-

* The operation may be performed as has been recommended, without the entrance of the least portion of air, by drawing off the fluid through a catheter passed through the canula, which should be then drawn down the catheter, and the external orifice of the latter kept below the surface of the fluid in the vessel into which it flows.

racteristic of the disease in the young and robust. Pericarditis often exists in young children, brought on by cold, and is not unlikely to be mistaken for pleurisy, with which indeed it may be complicated. In these cases the stethoscope furnishes us with great assistance in our early discovery of the disease.

PERITONITIS.

Peritonitis may arise from cold or suppressed perspiration, from external violence, or from irritation extending from the mucous membrane of the intestines themselves, from ulceration and perforation of their coats, from strangulation or invagination of a portion of intestine, and also from various affections of the organs with which this membrane is more or less extensively connected as a covering, as the liver, bladder, uterus, &c. In the last mentioned case there is often the generation and absorption of putrid matters, the complaint resolving itself into what is termed puerperal fever, easily communicated to others similarly circumstanced in which case, at least, we must suppose that the local inflammation, when it occurs, is secondary to the fever.

Generally speaking, serous inflammation, with the exception perhaps of pericarditis, and some forms of puerperal fever, is very amenable to the treatment of art. We cure a large majority of them, and this by treatment actively depletive and antiphlogistic, such as would doubtless be fatal if incorrect; whilst, on the contrary, such cases, if left to themselves, prove almost invariably destructive. Mercurials combined with opiates are of great power in peritonitis, for obvious reasons.

INFLAMMATIONS OF VISCERA.—Empresma of Good.

These affections may be less acute than the last, often more latent in their approach, and less marked by severe pain. They vary so much with regard to the viscus or structure affected, and in their results and complications, that it is difficult to give a sketch of them; the study of

one or two of them having been in many cases the principal labour of the most acute minds. It is rare that we are presented with an instance of general inflammation of one of the principal viscera, as such a case can scarcely exist with life.

ENCEPHALITIS.

The substance of the brain may be affected with inflammation from the same causes as meningitis, and the effects produced on its structure and functions are various and important—disturbance or exaltation of sensation and the mental operations, with deranged sleep in slight inflammation; perfect lesion or loss of these functions, with convulsions or paralysis, when change of structure or effusion has taken place. The membranes do not commonly remain quite unimplicated in encephalitis.

Acute hydrocephalus is now admitted to be a true phlegmasia or empresma, and not a dropsy. Dobson introduced mercurials, and Withering digitalis, in its treatment. Whytt noted the remarkable effect of the disease in the pulse, and Cheyne well divided the disease into the stages of excitement, diminished sensibility, and paralysis and convulsions, and he noticed also the frequent occurrence of liver and bowel derangements in the disease, often, perhaps, causing it. It is, as it occurs in children, unattended with other symptoms of dropsy, and unlike it, requires, at any rate at first, bold antiphlogistic treatment. In some cases it is a less sthenic disease, but the result of debility, scrofula, scarlatina, &c., and sometimes runs into the chronic form, an affection purely asthenic and often congenital, in some cases the mothers having been anæmic, chlorotic, or dropsical.

NACRENCEPHALUS.

The changes of structure above alluded to may be various, for instance, suppuration, or a very important one, named by the French, *ramollissement*. From the investigation of the eminent pathologists who have paid attention to this

last change of structure, it appears often to be most analogous to gangrene in other parts, and therefore produced by default of circulation as well as inflammation.

The treatment of these cerebral affections, often seen in a chronic form, must of course be difficult, and require pathological and physiological as well as pyschical knowledge. Though we may repress the inflammatory action, yet the morbid products and results may remain, and more or less impede the function of the part. In many cases it is demonstrable that effusions either of serum, lymph, or blood (which is, however, rather the result of apoplexy), may be removed by absorption, assisted by the action of those medicines which promote that function. Much may be done by a careful management of the patient with regard to those causes which have produced, or which increase, his malady.

Dr. Abercrombie endeavours to paint the different forms of cerebral inflammation, as indicated by the symptoms, as well as *post-mortem* appearances, particularly as they affect infancy, youth, adult, or declining age, or the surface and deep parts of the organ.

PNEUMONIA.

The lungs inflame from the effects of cold, general excitement, in fever and some other diseases, as hooping-cough and exanthemata, from the abuse of stimulants, and from various other occult causes, whether atmospherical or otherwise. Thus chronic inflammation of the lungs appears to prevail in the polluted atmosphere of some manufacturing districts, and, as it is said, pneumonia abounds in Naples during a disturbed state of Vesuvius. It often also arises when tubercles are present. From the nature of many of the causes, it follows that the male is more subject to the disease than the female.

The result of inflammation in the structure of the lungs is, first, *engorgement;* then *carnifaction* or *hepatization,* in which case they become impermeable to the air; and, lastly,

purulent infiltration through their tissues, or, in some cases, *gangrene;* all which changes were first described principally by Laennec and Andral. It is remarkable that, from some cause or other, perhaps their peculiar lobulated or divided structure, or their constant motion, the tissue of the lungs does not seem very readily to take on some pathological or sanatory changes, amongst others the formation of defined abscess, or the cicatrization of ulcerated cavities ; yet, having the possibility of an outlet through the bronchi, they have considerable power of restoration up to a certain point, more so than the brain or liver, and even cicatrization is by no means rare : hepatization is often seen to disappear, and by the stethoscope and other physical means of examination, we can now judge of the progress of this beneficial process ; also of the presence of pneumonia in a latent form, when the common symptoms, such as fever, dyspnœa, rapid pulse, pain, cough, and the peculiar expectoration, are less plainly marked.

In the treatment of this serious disease the truth and resources of orthodox medicine are fairly tested—the established rules of treatment are so energetic, either with or without the bleeding, that the same observation applies to them as has been made with regard to the treatment of serous inflammation. Through the lungs the whole of the blood of the body must be passed, once in less than two minutes at most, and it has each time to undergo a chemical change in their tissue ; if this is the case, are we wrong in lessening the amount of the volume of the blood, and consequently diminishing the necessity for respiration, as well as at the same time diminishing the morbid vascular action of the proper circulation of the lungs by free blood-letting, even at the expense of some temporary debility ? How contemptible is the conduct of that man who endeavours in such cases to persuade the weak convalescent that he has been injudiciously treated ! If we have a phlegmon of the hand, do we not enjoin cessation from the use of it, and prevent fluxion to it by raising it and placing it in a sling,

and also empty the vessels by leeching, and are not the two cases analogous? There is also one medicine, antimony, which possesses the remarkable property of lowering the action of the heart and lungs, of producing expectoration and other evacuations, and particularly of acting as a sudorific—properties well adapted to the cure of the disease, so much so, that the treatment may often be trusted to it alone, without bleeding at all, or any other remedies.

Such was Laennec's treatment, and Bennett and Todd are much in favour of diaphoretics alone. Dr. Stokes is an advocate for mercurials in enfeebled constitutions.

GASTRITIS.

Inflammation of the stomach, organized to be subjected to rather rough usage, is not common, except from the action of poisons or hard drinking. Long continued vomiting, and possibly ulceration of the organ, appear to have ensued in some individuals who had formerly injudiciously taken powerful chemical remedies, acids, or alkalies, or arsenic, for skin complaints. The bowels, too, often bear pretty hard usage, provided no obstruction takes place. The latter is a common cause of the violent and fatal enteritis which is sometimes seen.

GASTRO-ENTERITIS.

Yet there are other forms of gastro-intestinal inflammation affecting, like the preceding, principally the internal coat, and especially the mucous follicles and glands of Peyer, which are very common, particularly as occurring in our present fevers. The small intestines are most commonly affected with the inflammatory patches, extending however to the stomach, and also to the large intestines. Diffused inflammation, softening, ulceration, hæmorrhage, and fatal perforation, are common consequences. Though Broussais was evidently in error in attributing the essence of fever to this gastro-enteritis, yet a knowledge of its pathology forms one of the improvements of modern medicine. There is no

doubt that this inflammation may cause all the symptoms of fever, and even strongly marked cerebral disturbance, and yet be but slightly indicated by pain on pressure, vomiting, diarrhœa, thirst, state of tongue, &c. Gastro-enteritis, also, is a common sequela of other diseases, of phthisis, for instance; and many obstinate cases of so-called indigestion are no doubt instances of gastritis, attended perhaps with ulceration, or going on, it may be, to scirrhus. The celebrated Beclard was so affected, and persevered in treating himself by the application of leeches, counter-irritants, and mild diet, instead of the usual remedies for indigestion, though at first discouraged by want of success; after his death, which took place from another cause, an ulcer was found in his stomach, but it was cicatrized and the organ itself free from inflammation.*

HEPATITIS.

Though the liver is an organ of a somewhat torpid character in disease, yet it is liable to inflammation and abscess, and to several anomalous alterations, which may be often set down to chronic inflammation; such are hardening, and cirrhosis, tubercle, and encephaloid.† In hot climates, the lungs being less capable of decarbonizing the blood, according to the views of Liebig, the liver is the more called into action, and more subject to disease, particularly if the food is of such a nature as to require much of the purifying process accomplished in this organ. Spirit-drinking, according to these views, ought to give rise to chronic inflammation of the viscus, which is remarkably the case. Injuries of the brain and phlebitis cause pus to be deposited in the liver,

* Dr. Stokes, Cyc. Pract. Med. Vol. ii.

† Cirrhosis appears to be a species of atrophy; but the liver may be also congested, and this congestion may affect principally the hepatic intra-lobular vessels, or the portal inter-lobular ones; in fatty degeneration particles of fat are seen in the cells of the lobules. Various entozoa also may affect the liver, particularly hydatids and the liver-fluke (distoma).

and abscesses are also caused in it by dysentery. Gastro-enteritis or duodenitis is often connected with hepatic inflammation, and in such cases a serious jaundice often ensues, without any mechanical obstruction in the bile-ducts, the most direct cause of it; indeed, acute cases of this description present many of the characters of yellow fever. Hepatic abscess may be attended with little pain, or quickening of the pulse, but shivering, jaundice, cough, sickness, tension of the muscles over the liver, and pain in the shoulder often betray it. The abscesses may discharge their contents in various curious ways, through the lungs, by the bowels, or through the integuments, each case showing remarkable resources of nature, but of course replete with peril.

We have already alluded to inflammatory action of the kidney, and shall have to notice its diseases again; to a living physician, Dr. Bright, we are indebted for the fresh impulse which has been given to the study of this organ and its diseases.*

GENERAL STHENIC DISEASES, FEVERS.

The preceding diseases have been principally inflammations of the solid tissues or organs, often proceeding from injuries or irritations from within or without. The following, to the end of this chapter, are remarkable in being general diseases, with a morbid state of the fluids, produced often by some contagion, ferment, or poison, taken into the circulation.

In fevers, with the exception of traumatic and sympathetic fever, no particular organ or function, or system of organs

* In a case which lately occurred to our notice we found the upper part of the left kidney occupied by an encephaloid mass, weighing five pounds; the liver and lungs also abounded in small round encephaloid tumours, varying in size from that of a pea to that of a marble. The heart was enormously enlarged, and the aortic valves were diseased. The patient had been a drunkard, and had also ascites; of course bloody urine was a symptom—the right kidney sound.

or functions, is, in our opinion, primarily, particularly, or necessarily affected, though they often become secondarily implicated, and their most visible phenomena are those of increased action, particularly of the circulation. In idiopathic fever a debility of the system and a derangement of the ganglionic nerves, commonly precedes the vascular disturbance. This primary nervous derangement, however, is as much a matter of inference, as capable of proof, for it is much less appreciable than the following over-action. Fever, then, appears to be a perturbation of the system, and, at least at first, an exaltation of the natural powers, the consequence of any injury, or of any noxious agent, and calculated to offer resistance to such influence, and to restore the system to a healthy state; or it may be the reaction following any debilitating cause, which may for some time have acted on the nerves of organic, or perhaps on those of animal life. Immediately previous to this increased action it appears that the system is oppressed, the brain torpid, the heart flagging, the vessels congested, and chills present, to be succeeded by reaction of the heart and arteries, as well as the nervous system; the secretions probably become stopped, there is thirst and a hot skin, quick respiration and pulse; lastly, increased perspiration follows, and a general relaxation of the pores and secretory membranes. This process may be many days in being accomplished (continued fever), or it may be repeated in ephemeral exacerbations, each attack being an epitome of the whole disease, that is, having a cold, a hot, and a sweating stage (remittent fever), or, lastly, having intervals in which the system seems perfectly relieved, though debilitated, but with the paroxysms recurring at certain regular periods after one or more days (intermittent fever).

SYMPATHETIC FEVER.

When this arises in surgical cases the rigors are less marked; but generally speaking this form of fever has the same symptoms which characterise the idiopathic disease—

chills followed by heat, quick pulse, lassitude, and pain in the back and limbs, headache and disturbed mind, and thirst. In some cases of fever it may be difficult to say which is the antecedent, the general or local disease.

HECTIC FEVER.

When, in sympathetic fever, the cause is incurable or continued, a suppuration for instance, the heats become transient, and are principally marked by flushings of the cheeks and palms, the secretions are restored and become excessive, as those of the bowels or skin, the appetite returns, the tongue is not unhealthy, the head is clear, but emaciation rapidly goes on, and the urine is thick with the *débris* of the too rapidly oxidized tissues. The pulse is always rapid and there is thirst. In many of these symptoms we see a fruitless effort of nature to throw off something noxious. The mucous membrane of the digestive organs finally suffers most from the same over-action, and aphthæ in the mouth betoken that it is inflamed, constituting in this case an irretrievable state of things. The mind continues clear, the legs finally become œdematous, or occasionally present petechiæ or vibices.

CONTINUED OR IDIOPATHIC FEVER.

In continued fever there are present the same symptoms as in the sympathetic, but from a different cause. There appears to precede it some long debilitating action on the nervous system, either direct or through the imbibition of some noxious principle (miasm or contagion) into the blood, and the fever appears to be an effect of the *autocrateia*, or preservative powers of the system, to throw off this matter from the blood through the excretions. According to Hippocrates, fever is a concoction and critical evacuation of a morbid agent, and we know of no better theory. The antecedents of fevers, their symptoms, progress, and gradual cure, as well as the existence of a demonstrable contagious principle in many cases, seem to show as much. Liebig's

views, at least of the exanthemata, are little different; he not inaptly compares the action of the system in fevers to that of a fluid when disturbed by the power of a ferment. But what is the nature of the noxious cause which gives rise to contagious fever? It evidently exists in the air, and is imbibed through the lungs, the vessels of which have been proved to have great power of absorption. Yet the chemists have not been able to show its nature, though Schönbein believes that one form of it is analogous to, if not identical with, one or other of the compound gaseous oxidizable agents, such as sulphuretted hydrogen, whilst he thinks that some of the other pathogenic states of the air, causing epidemics (influenza, for instance), depend upon the presence of an opposite neutralizing principle called *ozone*, of which one form is electrified or phosphorized oxygen. In the former state of the atmosphere animal matter rapidly runs into putrescence, whilst, on the contrary, putrid meat placed in ozone soon becomes sweet. Whatever the principle producing continued fever may be, it becomes innoxious when much diluted, and chlorine, and hydrochloric acid, and possibly iodine and the acid gases, appear to neutralize it. It is produced too by the person affected, and it invariably is generated when individuals are congregated together, particularly in dirty and close quarters; temperature appears to influence its activity, and certain forms of the contagious principle apparently cannot exist below or above a given temperature. Thus, yellow fever has never, at least in our times, affected our latitude.* Continued fever in many cases arises spontaneously, that is, from no imported miasm; thus some dirty and crowded families are constantly suffering from it.

Common fever varies much in its character or type, as it is called. It would seem that for long spaces of time considerable portions of the human race are in some respects different in constitution from what they are at others.

* Pestilential fevers with similar symptoms appear to have affected our island in Saxon times.

Twenty years back continued fever, in some parts of England, might be termed cerebral, and some considered its essence to consist in inflammatory action of the brain. Latterly it has been much more commonly attended by inflammation of the gastro-enteritic mucous membrane, and not unfrequently with a minute or miliary eruption, or with bronchitis, &c. In what have been termed putrid fevers, and perhaps in most others, a deranged state of the blood appears to be present: generally speaking, all fevers have a tendency to the adynamic or typhoid form, attended with stupor and prostration. If peculiarity of cause or miasm has anything to do with the production of these differences, they have not yet been elucidated.

Though we must admit that there remains much pertaining to the causes and nature of fevers, and other allied diseases which is attended with doubt, yet their treatment, founded upon such a theory as that of Hippocrates, medicine in this case being considered but the assistant of nature, is attended with much success, a very small proportion of our patients dying.* Such treatment must vary, or be even of an opposite nature, in different cases: a gastro-enteritic fever may require opiates, leeches, or counter-irritants; a cerebral fever moderate depletion and mercury; a typhus bark and wine. The treatment generally consists principally in moderating excessive heat by cold affusion, or over-action by evacuants, particularly antimonial diaphoretics, and in the administration of regulated alterative mercurials, or, in some cases, in supporting the flagging powers of life. Blood-letting, in the theory of Hippocrates or Liebig, would not necessarily reduce fever, for though a portion of the noxious principle would be thus evacuated, yet the blood that remains must be equally infected, and the power of resistance materially reduced. Topical bleeding, for any local phlegmasia, which may arise, may indeed be often necessary.

It has been proposed to cure fever or prevent its access

* The danger appears to be in an increasing ratio according to age.

by strong tonics, as large doses of quinine. The plan appears rational, and might be supposed to cure by removing the antecedent nervous debility. Another plan, certainly sometimes successful, has been to administer antimony in repeated doses, so as to vomit, sweat, and act on the bowels, thus rousing the energies of the system, and at the same time exciting the secretions.

REMITTENT FEVER.

Frequently a remittent character is noticed in the symptoms of fever, even in our own country, particularly in autumn and hot seasons, and in children (in the latter case the disease being erroneously called worm-fever), or in individuals who have previously resided in fenny districts. In such cases the symptoms generally become worse after noon, at other times there is more than one exacerbation daily, and the stomach and bowels are principally implicated.

INTERMITTENT FEVER.

In the intermittent of temperate climates this periodicity is very remarkable, but perhaps it may be explicable when we consider the intermission, which is predominant in the healthy functions of the body, all of which appear to be subject to a state of alternate activity and repose: we see this in waking and sleeping, in the excited and passive state of the sensations and muscular power, in the organic functions connected with digestion and the formation of the tissues, to some extent in the action of the heart and frequency of the pulse, and in the amount of decarbonizing action going on in the lungs as shown by Prout. M. Bailly attributes periodicity to the erect position of man, alternating with his recumbent position in sleep, or rather to the changing irritations and congestions, particularly of the circulation, which those circumstances produce. Others have attributed the circumstance of the regular recurring fits of ague to the nature of the cause, but the only circumstance of a periodical nature in malaria is its being most freely

given off during the night. In a quotidian the fit occurs daily and early in the day, in a tertain every other day at noon, and in a quartan every third day in the afternoon. But the paroxysms are liable to be duplicated in various ways, and to change type, commonly, unless the complaint is increasing, becoming less frequent but perhaps stronger. The attacks of some epilepsies appear somewhat similar. The occurrence of one diurnal exacerbation, as we see in cases of fever, hysteria, chorea, hemicrania, and in the symptom of pain generally, may be well accounted for by the above considerations, but when the intervals occupy several days or even weeks, as when a male epileptic patient has an attack once a month, almost to the hour, there is more difficulty.* In such cases there appears, as Dr. Holland observes, something like an accumulation and expenditure of a certain amount of irritability, unless we choose, with Mead, to have recourse to the effect of lunar influence. The occurrence of the attack at a particular hour of the day is less surprising, than that the fit should skip as it were one or two days.

The origin of ague in malaria or marsh-miasm is one of the best established facts in the history of these diseases. The same cause, but perhaps varied somewhat, appears to be the origin of remittent fever, as that of Italy, and also of yellow fever, the last being supposed by the contagionists to be communicable from one person to another. The depressing effects of the *effluvium* of marshes is evinced, even in this country, by the faint nausea experienced in passing through them in the evening or early morning, and in some climates it is extremely dangerous to inhale their exhala-

* The catamenial flow is an instance of a very remarkable periodicity in the system, so remarkable that there must be some peculiar cause for it. Perhaps modern research throws some light on the subject; it now appears that in every period of menstruation an ovum escapes from the ovary, and may we not suppose that these ova have a certain stage of growth in the ovarium as well as in the uterus, in the former case occupying about a month, in the latter nine?

tions during the night. Speaking of the fatal Bight of Benin, Dr. Daniell observes, "The characteristic features of the shores are their excessive lowness. They preserve here the same dull and unvarying outline of one vast alluvial and densely-wooded forest, extending over an area of at least one hundred thousand square miles, partially irrigated by the Atlantic tides, and intersected by numerous rivers and creeks, whose muddy banks are unceasingly overflowed." The odour of the exhalations is perceptible several miles out at sea, and the tainted waters are loaded with vegetable matter. Sea water marshes are thought to be more noxious than those of fresh water, and bogs and mosses seem to be innocuous; estuaries and muddy shores, and the bilge water of ships, appear to be sometimes the originators of disease. Whatever the noxious principle of malaria is, it seems to be united with the fogs of the marsh, and does not extend far from it. One would suppose that there must be an abundance of the combinations of hydrogen, carbon, sulphur, and ammonia, in such spots. Eudiometrical experiments, though they have been much advanced, have yet failed to throw light on the atmospherical causes of disease. Indeed they may be, like the particles of yeast, or pus, minute semi-organized globules, or sporules, and not likely to be detected.* Putrid animal effluvium may evidently be sometimes respired to a considerable extent with impunity, as is seen every day in the dissecting room, and in several trades, and though there are well authenticated instances where the inhalation of putrid animal matters has been dangerous and even fatal, yet the degree of putrescence does not appear to be the measure of the chance of infection, the exhalations and secretions of the sick, or the air of over-crowded rooms, being far more dangerous than the most putrid animal substance, as far as

* We know of nothing more like the principle giving origin to these diseases than the sporidia of fungi floating in the atmosphere everywhere, and far and wide, only germinating where they find a suitable soil and nidus, and a certain degree of heat, moisture, and electricity, but when grown, again producing the seeds of propagation.

the causation of fever is concerned. In both ague and typhus, we conclude, that some poison is generated of a volatile nature, but it may be no more chemical in its *modus operandi* than morphine or aconitine. It has been shown by Humboldt that neither intense heat nor moisture will alone produce tropical fever, nor moisture combined with heat.

The treatment of intermittent does not much differ in principle from that of other fevers. Bleeding is only useful occasionally, particularly when the disease becomes complicated; purgatives are more generally so, and emetics often cut short the fits; mercury is valuable in the visceral complications, and opium appears to deaden the nervous system to aguish impression, and is sometimes used both as a curative and a prophylactic stimulant: but quinine and sometimes arsenic are given during the intermissions with confident hope of fortifying the system to resist the disease. Heberden thought highly of calamus aromaticus, and piperine has also been recommended.

YELLOW FEVER.

Ague, remittent, and yellow fever, probably arise from a similar miasm, and are members of the same family of fevers, modified by climate, &c., and often dignified by a variety of names, derived from the countries which they affect. Yellow fever is the fever of the tropics, acting on the constitution of Europeans,* impaired often by intemperance: it is marked by extraordinary cerebral, vascular, gastric, and hepatic disturbance, the blood is disorganized, and the disease most generally, at the present time, is considered to be contagious, or at least extended occasionally by human intercourse. The complaint seems scarcely capable of being imported into or propagated in our latitude, unless it might be for a short time in a hot season; the north of Spain and Marseilles are

* In the African expedition fever destroyed more than a fifth of those engaged in it, but no black man, though there were many on board the three steamers.

perhaps the most northerly points where it has spread itself. Probably the New World gave birth to it. The anti-contagionists have shown, that in the countries affected isolated cases of a similar character occur at all seasons, and that in Spain it has by no means been confined to the ports, though it has repeatedly affected them—Cadiz or Gibraltar, for instance, and they have also shown that a similar disease has long been known there, but they appear to have just traced its existence to a few years subsequent to the expedition of Columbus, whose men were known to have suffered from yellow fever; an instance amongst many others where the injuries inflicted by one race of mankind upon another have been retaliated upon the oppressors, and also of the fact that new intercourses between races are followed by new and serious diseases. The anti-contagionists also appear to have shown that yellow fever has sometimes originated in foul and crowded ships, but this only in tracts where the disease occurs (and often they have touched at spots subject to the complaint), an argument perhaps more against the marsh origin than the contagious nature of the disease. It appears that the West Indian practitioners have, generally speaking, been disbelievers in contagion, but against this may be set the contrary opinion of the Spanish physicians, who believe that the disease is always imported into their country. Some individuals, particularly negroes, and women, and children, are, it is shown, very little liable to the disease, but contagionists may admit this, as well as what is observed above, and that a ship with this or any other pestilence on board might visit a port and not spread infection, when circumstances and season were unfavourable to its propagation, without conceding the main point. There are so many well authenticated instances, where infected vessels have brought the disease to far distant ports and islands, which till then had not suffered from it, that probably the general opinion at the present time is leaning to the side of contagion, at least to the extension of the disease through human intercourse. The anti-contagionists do not at all explain

the spread of the disease, but have recourse to some mysterious or ill understood principle, which it perhaps is not necessary to admit. That this fever should show a contagious or self-propagating power least in the country of its origin, when the inhabitants are constantly exposed to its attacks, may be imagined, and that in the West Indies, its native country perhaps (for the anti-contagionists deny its importation from the African coast), it often has not a personal, but a local origin, may also be granted; but when we see how the disease attacks the ports and shores on either side the wide Atlantic, and find that no winds can convey it, no subterranean influence extend, when we see it, amongst other ports, constantly affecting Gibraltar, so airy and well regulated in sanitory respects, we are led to conclude, if tropical temperature is not its general cause, that it is conveyed by ships from shore to shore, and if by ships surely by persons.* Yet, as in all other cases of contagion, there must be disposing causes for the propagation of the disease, an attention to which is often a better safeguard than to the true exciting cause.

It is certain that in many of these diseases, yellow fever, plague, influenza, or cholera, which might rightly be named *pestes*, a bad state of the air long precedes them, evinced in various ways; but this does not prove that one or more distinct poisons are not at length generated, propagable in a less extended method than by general atmospherical derangement. In some diseases such a principle of contagion can scarcely be disputed. Should the doctrine in the case of yellow fever or cholera be wholly disregarded? We think

* Contagion, it may be seen, is not here confined to instances where a poison is generated only within the human body, and where it is communicated and propagated solely by two individuals being implicated, and if we believe yellow fever or cholera to be caused by a poison somehow originally generated in the air, and capable of altering the human fluids and solids by its operation, can we be accused of too easy belief in supposing that the system itself, as well as the atmosphere, may secondarily generate and emanate the cause of the disease?

(in spite of the positive opinion of Boards of Health) that experience of the past says no.

The cerebral and nervous disturbance in yellow fever is described as marked by headache, by brilliant and suffused eyes, and great pain in the limbs and back, jactitation, &c. The gastric and hepatic symptoms are various, vomiting of the food and of a mucous fluid, yellowness of the skin, and occasionally bilious urine, with sometimes a deficiency of bile in the fæces, the bowels, unlike what they are in cholera, being at first costive : eventually epigastric pain, the peculiar vomit, singultus, hæmorrhage, hæmoptysis, the tongue as in bad cases of fever, coma. Such, with other symptoms of pyrexia, make up the phenomena of the disease, the cerebral symptoms evidently less marked than the gastric and hepatic. After death the liver as well as the œsophagus, stomach, and bowels, are found somewhat changed, but apparently less so than we might expect, or than they would be if these changes constituted the *essentia morbi.* The blood appears disorganized. It is thought that the treatment, like the disease, should be active, bleeding, vomits, purges, mercury, and cold, at least to the head.

Common fever receives its names from the organs in which the morbid action appears to be reflected by the nervous system, from the stage of the disease, the degree of action in the system, or from the states of the tissues and fluids ; the latter probably much influencing the degree of infective power.

PLAGUE.

On fevers, abscesses are frequent attendants, and take the place of the buboes and carbuncles of plague ; this last, of which the black death of the fourteenth century was a form, appears to be the superlative of continued fever, arising, like it, from animal exhalations, and developed by an intensity of the predisposing and exciting cause, temperature, &c. It is the production of filth, and might be called the Egyptian or Othman fever (yellow fever having been termed the maritime), arising probably from the abominations brought down

by the Nile, as cholera does from the still worse ones of the Ganges. The south wind attends the inroad of plague in Egypt, whilst that of the north, in June, at the summer solstice, puts a stop to it. Its contagious nature has been pretty generally admitted, though denied by Assalini, Clot Bey, and some others, but this contagion, like that of typhus, appears to extend but a little distance, and it has been commonly thought that actual contact is necessary, and that the use of oil externally, or the presence of some cutaneous affections has prevented infection, but there is probably little foundation for this. There are well authenticated instances of quarantine officers contracting the plague in uninfected ports after the inspection of vessels or their men, arrived from distant parts, where the disease existed. When in plague, cholera, or yellow fever, cases of the disease occur after such and similar intercourses, whilst the individuals excluded from such intercourse, but placed in the same circumstances in other respects, remain healthy, we do not see what grounds of doubt the anti-contagionists can have, even if, on the other hand, it be found that many individuals may have intercourse with those affected and escape.

Plague is well known to be one of the oldest of diseases. England has not suffered from it since the year 1665, Marseilles was severely visited in 1720, Moscow in 1772, it visited Malta in 1815,* Neja in 1816, Venice 1818, and Silesia in 1819. It it attended with the eruption of petechiæ, vibices, buboes and carbuncles. Instances are on record, in which the inhalation of extremely putrid vapours produced a similar sporadic disease. Like typhus, plague may attack an individual more than once, in which respect it differs remarkably from the exanthemata. At its visitation of Marseilles, one-ninth only of the population escaped, and of those attacked one-half died.

* On this occasion we are informed by a then resident on the island that the complaint was clearly introduced by a Maltese surreptitiously conveying some skins from an infected vessel in quarantine, he himself and all his family being the first victims. It was introduced in a similar way at Marseilles. Russell believed second attacks to be very rare.

EPIDEMICS.

Certain diseases naturally follow here, connected with a deranged or unusual condition of the atmosphere, by which means they are at times extensively, and sometimes rapidly propagated, and are frequently contagious—as dysentery, influenza, epidemic or malignant cholera, and perhaps hooping-cough. There appears to be in most diseases two or more degrees, often well marked, a mild and benignant form, and an aggravated one, as is seen in an inflammation or in one of the exanthemata, for instance—dysentery, Asiatic cholera, and influenza appear to be the violent forms of certain commonly mild diseases, diarrhœa, common bilious cholera, and catarrh. Yet are they so violent that they are particularly entitled, together with the plague, to the name of pestilences, as well as from their epidemic nature. There are too many resemblances in the symptoms of common and epidemic cholera to doubt that there is some relation between them. All these diseases, too, agree in being of the nature of fluxes from the mucous membranes.

DYSENTERY.

Dysentery is *par excellence*, the pestilence of armies and camps, and differs from gastro-enteritic fever in its anatomical relations, the inflammation and ulcerations of the mucous membrane being confined to the large intestines. It probably is not caused by any specific miasm in the atmosphere, though it sometimes alternates with intermittent fever, but by its vicissitudes of heat and cold, by moisture, and by an exposure to these from insufficient clothing or bedding; also the emanations from ordure,* indifferent food and bad water appear to be efficient causes. Pringle and many eminent observers have considered the complaint to be truly contagious, but it is evident, on the broad face of it, that it is not generally so. Formerly the disease was extremely common in England, and annually destroyed great

* Pringle.

numbers of the population. It still occasionally appears in marshy districts, and in seasons of scarcity, and a very similar disease, attended by tormina and tenesmus, and the discharge of bloody mucus is sometimes prevalent in young children, owing to similar causes, more especially inappropriate food; the old also not unfrequently suffer from it. The liver often becomes affected by inflammation or suppuration in cases of dysentery, particularly in tropical climates.

The treatment of the disease agrees in some respects with that of influenza; both are much relieved by Dover's powder, and other medicines determining to the skin, but according to Sir J. M'Gregor, and other competent observers, the lancet may be used in the primary stage of inflammation and fever. This mode of treatment has been verified by other eminent military practitioners, but of course it varies infinitely in different circumstances.

CHOLERA.

Asiatic or epidemic cholera is at present one of the most interesting of diseases to us. Whatever obscurity there may hang over the subject of contagion, and the origin of other diseases of this family, their nature is not very obscure, at any rate they are tolerably amenable to treatment—but with respect to this terrible scourge, we are not only in a degree of uncertainty with respect to its cause, but are in doubt as to its nature, and when the stage of collapse is once set in, we can cure but a small proportion of our patients. But the disease is still new, and let us hope that some happy individual amongst us may throw more light on the subject. This disease certainly appears to have received its birth in the *delta* of the Ganges, the sacred river of the Hindoos, but the receptacle of the filth, ordure, and carcases of the native population on its banks, constituting possibly the specific cause of the disease.* We may suppose the germs to have been first generated here, and to spread to wherever a suitable atmosphere is found for their existence. To

* Dr. Johnson on Tropical Diseases.

reach the western confines of Europe, and in its course afterwards, the disease has commonly, but not always, travelled in the north-west direction, the route of intercourse between Europe and Asia from time immemorial: the extreme north and south of Europe has been more tardily affected, probably from climate, ranges of mountains, and infrequent traffic. In the East it appears that alpine ranges have proved an ineffectual barrier. It is not certain that the disease did not exist in India previous to this century, though Annesley and others, who have had good opportunities of inquiring, think not. Early in the present century it was described as a new disease in Madras, and called *mort de chien*, or *mordezyn*, the latter according to Good not derived from the French, but from the Arab *mordeikie*, death-stroke, the French name being possibly a corruption itself. Its propagation is remarkable in several respects, generally along the line of roads and rivers, the channels of traffic, but principally affecting the spots where the most wretched, and dirty, and dissipated are congregated. Indeed, though it is no doubt in some cases propagated almost from man to man, yet certain circumstances, the above amongst others, are necessary to maintain its existence; it rarely affects the healthy and temperate, living in clean, and somewhat elevated situations. Sporadic cases have been said to occur when the epidemic does not exist, though others would doubt the nature of such instances, and consider them to be only the ordinary cases of sudden collapse which occasionally occur in practice. From the gradual operation of a variety of causes, meteorological, sanitory, or political, at certain times we appear ripe for the outbreak of epidemics. Other epidemics, especially diarrhœa and dysentery, have preceded the inroads of cholera. Diarrhœa, too, is commonly the premonitory symptom of the disease. When the collapse supervenes, it appears as if the organic nervous system, and the organs of organic life which it animates, were exhausted of their vital power, indeed some of the viscera, as the liver and kidneys,

as well as the heart and lungs, appear really paralyzed. The secretion of both bile and urine is stopped, the pulse fails, and the breath and skin are cold as if no oxygenation were effected ; this is seen too in the lividity of the latter, and, as a consequence, it is shrunk, as well as the countenance altered, and the eyes sunk in their orbits. Perhaps the vomiting and purging show an effort of nature to get rid of some blood-poison, but if so, that fluid is ruined in the effort, its serum escaping, leaving a dark dissolved fluid in the vessels. The organic nerves affect, by a reflex action those of the muscles, producing the severe cramps. The voice becomes a whisper, but the mind is little affected. The attacks often commence a few hours after midnight ; after death the temperature of the body often rises ; the muscles then sometimes show a curious spontaneous contractility seen in movements of the eyes or limbs.

We may, with the non-contagionists, grant that cholera will at different visits find out the same haunts, often in a remarkable manner, as recorded by them, that it may take a retrograde course, or make great leaps, or that different towns may present cases nearly at the same time, though distantly situated ; all this may occur if the disease is propagated amongst those disposed to it, by some extended miasm, and yet, as we believe it is in many cases, by proximity of affected individuals, or by human intercourse likewise. Or if a general miasm does not exist, which however few doubt, and if the disease, as some maintain, originates during certain vicissitudes of health, which communities undergo, still contagious propagation, by person or clothes, &c., is not disproved in many cases, in fact it is proved by other evidence. It may be shown by the anti-contagionists that the complaint should have appeared at Madras by sea before it arrived by land, and also in Ceylon brought by ship from Bengal before it arrived from the opposite coast; but, on the other hand, contagionists can show how vessels from Havre, Liverpool, and Greenock conveyed cholera to the Transatlantic shores before it arrived at the

remote parts of Europe, Sweden, or Italy, or even some parts of England; or how, during the last autumn, from the neglect of some simple restrictions it has been imported by the usual route from Holland into our ports at several different points of our shore, whilst the centre of the island was unaffected, the disease only spreading from these parts on the lines of road, and the individuals conveying it having been in many instances identified. In some cases the disease has been prevented by a few, not inconvenient, restrictions of intercourse.

In the Report of the Committee of the College of Physicians, drawn up by Dr. Baly, we have the following conclusions:—

The theory of a general atmospheric influence or epidemic constitution, electrical, telluric, or otherwise, as invariably causing and propagating (with or without certain predisposing conditions) the disease, does not correspond with some undoubted facts, as, for instance, the duration of the disease for a long time in one town, notwithstanding great differences in the atmosphere, winds, weather, &c.; * the very partial distribution of the epidemic, even in places evidently predisposed by localizing conditions; its outbreak and cessation at very different times in parts of the same town or even the same building; and the slow mode in which it spreads over a small country like England, the ports being its first centres; or across the Asiatic and European continents, often against the winds, in opposition to its rapid course over the Atlantic when conveyed in ships.

The Report advocates the doctrine that the cause of cholera is some floating atmospherical material agent, only partially distributed, having its *habitat* in the exhalations given off in low, damp, impure, and stagnant localities, of course augmented by heat, and particularly abounding where men are closely congregated.

With respect to the mode of the propagation of cholera,

* At Newcastle-under-Lyme we observed that violent thunder-storms did not affect the course of the disease.

the Report brings forward facts which leave little doubt that it generally takes place by human intercourse. Its first appearance in a country, invaded by it at sea-ports, its slow progress, its travelling in India in the teeth of monsoons, &c., show this; but, on the other hand, there are facts which also prove this to be not the sole method by which the disease is spread. The action of the winds is called into requisition to account for the rapid and wide-spread appearance of the disease in a port or district, as soon as a few cases of cholera have been imported and have communicated the disease. This idea of its diffusion is not well supported, except in one or two cases, and some might rather suppose that there exists in the atmosphere, when ripe for the outbreak of the disease, some matter of an organic nature, capable of being formed into the *materies morbi*, by an action analogous to fermentation in fluids, and that the imported poison is the ferment.

The subject of strict personal contagion from one individual to another, the question whether the emanations from the cholera patient will produce the disease, and whether the human body is the source or one of the sources of the cholera poison, the Report considers undecided. The sudden origin and rapid spread of the disease and its ultimate perfect disappearance for years, through a whole kingdom, are not very like the habit of other contagious diseases, as small-pox, and no one even attempts to trace all the cases as they arise to contagion. On the other side certain facts appear to favour the doctrine, as the undoubted introduction of the complaint into hospitals and asylums by new comers labouring under it; the continuance of the disease in such places or in towns, just as long as the population can, from its number, afford subjects for the attacks; and the frequent communication of the disease to nurses and attendants. Likewise, if there be, as the Report shows, no doubt that the complaint must be often conveyed by individuals in some way or other, and that it consists in a poisonous principle, we may perhaps believe, as already observed, that the

human body, which is capable of taking it in, and becoming affected by it, may also generate the same, and give it off, especially as we have analogous instances in other diseases.

In those case of cholera where recovery takes place, reaction, with symptoms of inflammatory fever comes on. This might make us suppose that the collapse is in reality the cold fit of some other virulent disease ; but the existence of the purging, and of some of the other symptoms seems to be against this idea. This stage of recovery has often been advanced by injecting into the veins a substitute for the serum which is poured out by the bowels, but in many cases the relief has not been permanent, scarcely one quarter of such cases appear to have recovered. But even this, with the favourable appearance which is almost always produced, is somewhat encouraging, and perhaps there might be some change made in the nature of the fluid injected. The serum from milk, produced by means of a bit of rennet, was injected into the vein in one apparently hopeless case, the present relief was great, but inflammatory fever came on and the patient died in about a week from the injection.* Ordinary treatment is sometimes attended with an amount of success, but it has been when unusual efforts have been made to carry it effectually out, greater than can often fall to the lot of the patient. At present it must be confessed that our successful treatment of the disease must be in the first, or what is termed the premonitory stage.

INFLUENZA.

Influenza has become a remarkable epidemic of modern times, though there is no doubt but that it has existed in our own country for centuries. Its symptoms are commonly, as is well known, those of aggravated catarrh, with fever, and great prostration of the vital powers. One of the most curious circumstances relating to it is the wide and sudden inroad

* This occurred in 1848. It has lately been proposed to inject such fluids into the peritoneum or cellular membrane !

when it becomes prevalent. The whole of these islands may be attacked in the course of a few days, and it extends over whole continents and distant lands in a very short space of time. The cause then must be different from ordinary contagion ; nor can we suppose the disease due to the gradual operations of cold wind, or wet, or fog, or any vicissitudes of atmosphere, for the onset is so extended, when it attacks a large community, as to preclude that idea—a score or two of individuals in a crew or *corps* of a hundred or two sailors or soldiers has been seized with the complaint in the course of an hour. Such circumstances seem only attributable to some sudden and wide extended change in the atmosphere, of some peculiar nature, a change in its relative electricity, or to some such principle as has been supposed by Schönbein, extended perhaps by means of winds, which appear swift enough to account for the phenomenon as far as rapidity of progress goes. Of late, many have been disposed to look for a cause of the disease in the occurrence of the lower forms of vegetable or animal life in the atmosphere. Two objections to such a view are, the less common existence of living organisms, even the lower ones, in cold weather, when some of these diseases prevail—and the law of the geographical limitation of species, even the lowest forms of life not appearing to have so general a distribution as here inferred.

Many of us have had opportunities of judging of the degree of relief which medicine can offer in this disease, extremely fatal no doubt to people advanced in life—encouraging the cutaneous exhalation, mild aperients, and expectorants, and counter-irritants. Such means, followed by tonics, as quinine, seldom fail to assist materially in restoring the patient to health.

HOOPING-COUGH.

Hooping-cough is a very curious and anomalous disease, more fatal than any other in early childhood, attended with

fits of violent spasmodic cough, and peculiar bronchial secretion; it is eminently contagious, and commonly affects individuals but once during life, and principally in childhood, in which respects it agrees with the next tribe of diseases, the exanthemata. It does not appear to have been known in Europe prior to the fifteenth century, the same age when another well-known scourge was imported, probably from the new world. At the present time it affects children in all countries and climates, according to the research of Dr. Gibb. We are totally unacquainted with the nature of the principle in the air on which this contagion depends; a change of it is sometimes remarkable for curing the disease. Young children have some tendency to spasm in affections of the respiratory organs, as we see both in this case and in laryngismus; a degree of voluntary influence appears to be required for the act of coughing, crying, and excited breathing, which children have not attained.* The disease, at any rate, is not commonly an inflammatory but a spasmodic one, and opium is often a most efficient remedy for it, when it is uncomplicated, which, however, it too often is with pulmonary, gastric, or cerebral mischief; the violence of the cough may also cause lesion of the heart and the access of morbus cæruleus. Belladonna has probably a similar power to opium; many of the so-called remedies have little effect, nor the popular ones of alum, potass, cochineal, cup-moss, &c.† The *sputa* apparently present no peculiar microscopical characters. The respiratory nerves are probably in a state of irritation in this disease.

ERUPTIVE FEVERS, EXANTHEMATA.

The true exanthemata are eruptive fevers, which may be proved to be caused by the reception of a virus into the

* If the disease happen to be escaped in childhood, the individual afterwards in the adult state is seldom subject to it.

† In few words, these remedies have been antiphlogistics, diaphoretics, emetics, narcotics, mineral and vegetable tonics, astringents, anti-

circulation, acting much in the same way as a ferment does in a fermentable fluid, and incapable therefore of producing the same action again in the same person. The product of the virus is of the same nature as itself, and therefore such diseases are infectious.

Willan, Bateman, and others, argue that these diseases were known to, and described by, the ancients; but their quotations probably do not prove the assertion. Rhazes and the Arabian writers first described the small-pox, and probably it appeared first in the East near the time of the founder of the Mahometan faith; and about the same period scarlet-fever and measles. The two last were not discriminated from each other by Sydenham and Morton, and indeed not till the end of the last century, when Withering distinguished them, though the malignant form of scarlet fever was noticed long before. Though small-pox very likely existed in the eastern world from a remote period (according to the Chinese, coeval with the birth of man!) it now, when unresisted by vaccination, spares no race, and has almost exterminated some of the North American tribes; but thanks to our immortal countryman, Jenner, it is nearly disarmed of its terrors.

In scarlet-fever, or as it is unclassically named scarlatina, the infection is thought to be imbibed from two to four days before the fever declares itself, and the eruption appears at the same time; in measles from ten to fourteen, and the rash comes out four days later; in small-pox, about ten, and the pustules are seen three days afterwards. The eruption is soonest over in scarlet-fever, but sometimes liable to recur; the longest in continuance is small-pox, being of the deepest character. The premonitory symptoms are much the same in all, being, in few words, the usual ones of fever. In all, the heart, stomach, spine, and brain are much disturbed; in small-pox the distress is great indeed. In measles the fever is intensely catarrhal, sometimes pneumonia or œdema of the

spasmodics, inhalations, laryngeal cauterizations and counter-irritants. Dr. Gibb's remedy is nitric acid.

lungs ensuing, whilst in scarlet-fever the throat is commonly affected with membranous exudation, and often becomes gangrenous, constituting the primary danger; another subsequent complication being a serious dropsical tendency, also seen in measles, and often accompanied by pulmonary engorgement and renal lesion. These symptoms, arising from the deranged action of the skin, or the existence of some poison in the system, are very apt to occur on premature exposure to cold; the urine becomes albuminous or bloody. In small-pox the numerous and deep pustules produce considerable swelling, and then what is called secondary fever arises, commonly the most dangerous part of the disease. When small-pox has affected females during pregnancy, the infant appears sometimes to have presented the disease at birth, but this certainly is not commonly the case. Scarlet-fever is proportionally less dangerous in the very young child than measles or small-pox, but the last is very dangerous in the adult. Scarlatina more commonly affects individuals twice than the last two diseases.

The treatment of these complaints is conducted on the same plan as that of other fevers, but modified somewhat in each; thus the pyrexia in measles being of a catarrhal nature, cold applications might be supposed to do mischief, and increase the tendency to pulmonary inflammation, whilst they have been used with good effect in scarlet-fever. A tonic plan and wine may become necessary in bad cases, and many lives appear to have been saved by it; though generally speaking, in these cases, medicine should be the (not too officious) hand-maid of the natural curative tendency. It is a matter for experiment what power chlorine and other such chemical agents may have on these diseases, particularly when used internally in malignant cases; some have thought chlorine * in various forms one of the best

* The vapours of chlorine, iodine, hydrocyanic acid, and hydrochloric acid gas, render the vaccine lymph inert sooner than some equally powerful chemical vapours, nitric acid for instance, chloroform, or ammonia. The lymph reddens turmeric paper.

remedies in scarlet-fever. Much care of the patient is required in all the exanthemata during convalescence, for in all very serious affections are apt to occur. The anasarca and disordered renal function, occurring after scarlet-fever, are mastered by careful treatment: perhaps a diaphoretic plan, with or without topical bleeding according to the strength of the patient, and foxglove in the opinion of some authorities, is the most successful.

A few other diseases have been ranked by nosologists with the exanthemata. Varicella or chicken-pox is evidently entitled to a place with them; it appears to be a distinct disease from small-pox, but to have first appeared with it. The mumps (cynanche parotidea) is another trifling affection, yet certainly contagious; it is characterized by an inflammation and swelling of the salivary glands, and occasionally, but certainly not uniformly, on the disappearance of this, by a sort of metastasis to the testes or mammæ. Swelling of the former organs is certainly common in one stage of the small-pox. Boils and carbuncles sometimes appear to be epidemic in their nature, and have been thought to arise from some peculiarity of diet; the former have occurred in a severe form in a "vegetarian," who appeared to be living almost entirely on stale acescent bread, but they also occur under a variety of diets.

ERYSIPELAS.

The following diseases, to the end of the chapter are almost invariably produced by the inoculation of morbid principles or animal poisons, yet are quite distinct from the exanthemata in most respects.

Erysipelas is not unfrequently caused by contagion, of which there is abundant evidence, by polluted air, or by inoculation itself. It is epidemic at some seasons of the year, particularly at its fall, and endemic in some bad localities. Sometimes, however, it appears to arise simply from cold, particularly a cold draught of air, or from rain beating in the face; also from mental disturbance, or disorder of

the digestive organs. Unlike the exanthemata it rather disposes to a second attack. In certain states of the air the application of a leech or the smallest wound will be attended by the absorption of the deleterious principle, and give rise to the disease. It is the scourge of crowded hospitals, causing gangrenous inflammation, or phlebitis, and general pyæmia. Fortunately in the sloughing caused by erysipelatous or diffused cellular inflammation (a perfectly distinct disease from phagedæna, which appears to be a sort of gangrenous ulceration), the large vessels rarely give way, though in some cases they appear quite isolated or dissected. The usual symptoms of acute fever precede this complaint, with much gastric disturbance; sometimes the glands of the neighbourhood are painful and inflamed, even before the appearance of the discoloration. The symptomatic fever is commonly of a serious but low type; and, generally speaking, the most successful treatment is neither too lowering nor yet stimulating, though the latter is required in bad cases. Cold applications may be sometimes successful, but they are probably not so safe as those which are moderately warm, but not hot.

METRIA.

In puerperal fever, as mentioned before, the disease appears to generate a morbid agent, and to contaminate the system by the absorption of pus, or of putrid or morbific matter; and after death, in this case, a prick received by the anatomist at a *post-mortem* examination, will, as is well known, produce bad diffused erysipelas or necrusia, as it is called, or phlebitis with the formation of pus in the veins, and the poisoning of the mass of blood. Puerperal fever may also evidently be produced by a bad sanitary locality, and it and erysipelas may apparently originate each other; from such cases it appears that the blood is an organized and active fluid, or, in Hunter's words, endowed with life, and capable of being acted upon, and changed, by agents not strictly chemical, taken in either by inoculation, or through

the lungs or skin. Amongst these agents the aura of diseased or putrid matters, the inoculated matter itself, or perhaps the dry and floating corpuscles of pus must be classed.

We cannot doubt that in some cases where puerperal fever leaves strong marks of internal inflammation and suppuration, it is, unlike other fevers, except hectic, a symptomatic one of the more occult internal mischief, in fact, constituted by the symptoms of an inflammation, and not in reality a fever. Though the peritoneal inflammation cannot be identified with that of the erysipelatous kind, yet there is a similarity in the nature of the producing infections, and in phlebitis being often attendant on both. In many cases of puerperal fever the miasm must be taken in by the breath ; at other times from the accoucheur or nurse by the same route, or, it may be, by the touch ; in others the poison must be generated in the patient herself, and this appears to occur after difficult labours, retention of the placenta, hæmorrhage, the introduction of the hand, and the use of the secale in first confinements.

PYÆMIA AND PHLEBITIS.

Blood-poisoning from the presence of unhealthy pus presents certain dangerous symptoms, such as may plainly be produced in animals by the artificial admixture of pus with their blood, and the consequent formation of clots near the heart; sickness and purging show the attempts of nature to evacuate the poison ; and in man loss of colour or jaundice, præcordial anxiety, quick pulse, and other symptoms of low fever, fainting, delirium, and thirst, attend the disease.

In some cases of inoculation by morbid matter the principal symptoms produced are those dependent upon inflammation of the absorbents or veins, which may subside, or nature may make an effort to eliminate the poison from the system by means of abscesses in them or in the glands. The latter is particularly seen in syphilis or in plague. But often unhealthy pus gains access into the circulation, or is

formed within the veins themselves, and though Dr. Lee has shown that it has a tendency to produce coagulation of the blood, and so cause an impediment to its further absorption and circulation, unhealthy pus, or any other putrid matter, once admitted, most destructive deposits of it take place, in a variety of situations, in the most curious manner, by a species of venous sequestration as it has been termed.*

EQUINIA, FARCINOMA, ETC.

Inoculation from glandered or farcied horses has produced similar effects to those just mentioned, in the former case attended with an eruption of pustules, carious ossa nasi, &c. What is termed malignant pastule also is produced by inoculation from putrid animal matter, as likewise the malignant whitlow of cooks and dairymaids. Gangrene may attack sores or ulcerated extremities, as well as the umbilicus of infants, and malignant erysipelas may also arise, all from the close proximity of heaps of decomposing animal matter, a dunghill for instance, or the putrid ejectamenta of a slaughter-house.

VENENA.

The stings of insects and serpents may be classed here. In Britain such bites are seldom fatal: an infant about eight months old was thrown down by an affrighted and stung nurse, amidst a numerous swarm of the common wasp, and left there; when picked up it was covered thickly in every part of the body except the waist with their bites, there being some hundreds of them; yet the infant easily recovered with a cooling lotion and antiphlogistic treatment. According to Mead and Orfila, serpent-poison is neither acid nor alkaline, but contains some salts. The effects of some serpents, as the cobra capello, or rattle-snake, are indeed

* It appears, as far as we know of this difficult subject, that there may be phlebitis without pyæmia, or *vice versâ;* and that the abscesses in phlebitis are not formed from the exudation of pus through the coats of the veins; in fact, this is often very consistent and putty-like.

marvellous, the poison no doubt being rapidly taken into the circulation, and holding " such enmity with blood of man," as to cause rapid gangrene or disorganization of the part bitten, or of distant organs, and quick subversion of the powers of the lungs and heart, as well as convulsions and other nervous symptoms. Such an effect could only be produced by the poison as well as the blood having a vital power. Dr. Barry's experiments demonstrated the strong utility of preventing absorption in poisoned wounds—no doubt cupping or suction would often counteract their ill effects.*

Mussels used as food have sometimes a poisonous action; it has been carefully ascertained that a person, who suffered a dangerous attack after eating them, had often partaken of them before with impunity; and that a more delicate individual, who partook of the same mussels equally freely, was quite unaffected, a good example of the common circumstances attending the action of these poisons, and of disposition and indisposition to their effect. The symptoms were great præcordial anxiety and dyspnœa, urticaria and general swelling, beginning at the head and ending at the feet, vomiting and purging of copious and offensive stools. A few doses of ether effectually relieved the symptoms. There is undoubted evidence to prove that the ingesta of either putrid food or impure water, has often caused all the symptoms of a fatal cholera or dysentery.

HYDROPHOBIA, LYSSA.

That a virus exists in the case of this disease in the saliva few doubt. Its generation, however, in animals of the carnivorous race is not understood; it may be communicated

* Dr. Mead mentions that the serpent-charmers of India use certain stones (false bezoards) as appliances to these wounds; we have seen such, of the size and shape of tamarind stones, polished externally, but porous within: they are fixed on the wound by means of a little blood; if they act at all, for which, however, my informant vouched from his own observation, it must be by preventing absorption.

to some other classes of animals as well as to man. Magendie and Breschet's experiments prove that the saliva, derived from a man affected with the disease, produced the same in two dogs. It appears that dogs, in the wild state, as those of Egypt, never go mad; a dog apparently became so after living for some time on salt meat and scanty fare, and probably little water, though it is not certain that it was affected with the true disease. Hydrophobic animals appear to be insane, and men when attacked have been similarly affected; the propagation of such a disease by inoculation is a curious circumstance. In extreme passion and in epilepsy we see the formation of a frothy saliva, but certainly in these cases quite innocuous.

Mead, and Drs. Bright, and Watson, have well described the symptoms: it has been observed that the complaint might as well be called aërophobia as hydrophobia, the patient often showing as great a dislike to a stream of air as to water. Dr. Bright too notices that the senses of hearing and smell are at first much exalted, though paralysis or pain may afterwards occur in the organs of sense particularly. The whole nervous system is in a state of great irritation, and convulsive actions, particularly of the respiration and of the throat and fauces, come on. Pain in the part bitten and its neighbourhood precedes all this. The anatomical lesions appear to vary; probably the sensorial and involuntary tract of the medulla spinalis or oblongata is implicated through the blood, but theories of this sort have not yet been verified by dissection. In a case examined by Mr. Godrich, the preparation being deposited in the Museum of University College, the spinal cord was much inflamed, particularly about the last cervical vertebra. The cardia, œsophagus and pharynx are sometimes inflamed, but this is probably secondary. Pustules have been found in the spleen. This disease was recognized before the time of Christ, though it is not noticed in the Old Testament. Lyssa is mentioned in Homer as affecting the dog, but not as occurring in man, and this now well ascertained fact was also denied

by Aristotle. No cure is known for this abnormal disease, and we can only prevent it by excision, cautery, suction, or some disinfecting application. Tracheotomy might prevent or retard suffocation, which is often the immediate cause of death, and also from theory might be inferred as likely to prevent spasms or convulsions, both in this disease and in tetanus, as such cannot well occur without fixing the chest, an impossibility with an open trachea.

SYPHILIS.

For the many wrongs inflicted by the white upon the red race of man, there is one particular scourge which we in return appear to have received from them—syphilis. This disease it is said first commenced its ravages at the siege of Naples, at the termination of the fifteenth century, that is a year or two after the return of Columbus. Other authors have been of opinion that the disease has existed in Europe and Asia from remote times, but their proofs of this are not satisfactory.* Some think that we have no proof in the nature of the symptoms which we call syphilis, of the existence of any distinct disease, but the sequence and peculiarity of these symptoms, as well as their curability by mercury, seem to show the contrary, whatever we may think of the ultimate symptoms, exostosis and caries, whether they are caused by the disease or by bad practice. It appears that this complaint has often been most virulent when produced by the intercourse of distinct nations or races, and that for some time now it has been losing its effect, either from better treatment, or from its having worn itself out.

* Cazenave has collected evidence which, in the opinion of some, proves the disease to have existed from early times. Dr. Whitehead, in his recent work, believes the complaint to be already developed in the system of some children of infected parents before birth, and that constitutional syphilis, contrary to the opinion of Hunter, may be communicated to another person in various ways. Also that various diseases, as affections of the skin, and others commonly set down as scrofulous, owe their origin to the syphilitic taint. According to Dr. Whitehead, sycosis has the same origin.

FRAMBÆSIA.

There is reason to suppose, from the accounts of those who are familiar with the disease, that the yaws of the African and American races, the frambæsia or rubula of authors, and some say the sivvens of the Celts and Erse, is either the same disease as syphilis, or of the same family, occurring in dirty and ill conditioned races. It is propagable by inoculation and several of its symptoms are very similar. In some cases of secondary syphilis we see the formation of the same rupia-like sores, with raspberry-like fungoid growths under each crust, whilst in yaws there is also occasionally ulceration of the nose and palate. The treatment adopted seems much the same as that for secondary symptoms, sarsa, China-root, sassafras, guaiacum, contrajerva, sulphur, and bichloride of mercury; also externally, the leaves of Cissus, snake-wyth or yaw-bush, and cassava poultice.

CHAPTER V.

Diseases continued—of the systems—The digestive and assimilative, circulating, secreting, respiratory, and nervous systems—Mental diseases.

Hitherto we have considered disease as seen in the system generally, particularly in the blood, and caused commonly by agents from without, as atmospherical miasmata, or animal poisons, which have usually no special action on any particular organ or class of organs, and which are often occult in their nature, and difficult to appreciate. Disease, as it affects different organs, and through them the general system, becomes more defined, and more evident to the observation.

With a few exceptions, as inflammations, which might be distributed amongst the diseases of particular organs, most of the preceding affections are of an infectious or contagious nature, and not chronic in their character, but with a definite duration, and are not, like many of the following, capable of being transmitted from parent to child. Syphilis however might be considered an exception to this, though many will doubt its true hereditary nature, independently of inoculation; if it be so, like gout or scrofula, and continued, like them, from generation to generation, one would suppose that by this time almost all mankind must have become infected. From its chronic nature, however, and tendency to affect the tissues, it might well be placed with scrofula, as Cullen arranged it, and the same may be observed of certain chronical skin diseases. The affections which now follow, belonging either to particular organs modelled before birth, or to the solid tissues of the body, varying according to race or family, are often hereditary, or it may be confined to one portion of mankind. Most diseases appear to be either contagious or hereditary, except inflammations, and a few others of a somewhat abnormal and accidental nature, as land and sea scurvy, or delirium tremens, or alcoholic blood-poisoning. The latter with chlorosis being evidently diseases of the circulating fluid might have already been disposed of, but are placed in this sketch as diseases of the circulating organs generally.

Speaking of specific diseases, Mr. Paget observes: "In most of these the local phenomena are preceded by some affection of the whole economy: the whole blood seems diseased, and nearly every function and sensation is more or less disturbed from its health, the patient feels 'ill all over' before the local disease appears, that is, before the more distinct and specific morbid process is manifest in the place of inoculation or in some other part." This remark appears principally to apply to general blood-poisoning by miasm or in pyæmia. Variola or rubeola is preceded by constitutional disturbance, but so is pneumonia, whilst syphilis or vaccinia is not.

Diseases of the Digestive and Assimilative Organs.—Cæliaca of Good.

DYSPEPSIA.

Dyspepsia is entitled to the first rank amongst these diseases. Hunger and thirst, though attributed by us to the stomach and fauces, are in reality totally dependent on the states of the general system, and are the reflections of such states by the nerves on the organs which are principally concerned in supplying such wants. Thus the stomach may be affected with cancer and yet a strong appetite exist; it is also strong upon waking or whilst the nervous system is exhilarated—whilst grief or disappointment destroy it, as also do narcotics. Bulimia is also a symptom of tabes, when the mesenteric glands are affected, so that the absorption of the chyle is interfered with, and indeed of marasmus generally. So thirst attends all cases in which there is a superabundance of salts in the blood, as when we have swallowed an excess of common salt, or when its watery parts have been discharged, as in suckling, diarrhœa, diabetes, or dropsy. From such considerations we may take a hint that in some cases it is better to seek for a cause in the system for a deficiency of appetite, than to seek to increase it by bitters or acids. People are born, too, with great difference in their power of digestion. Some are obliged to confine themselves to certain food, others swallow most things with impunity, and there are some individuals who have the faculty of ruminating, a propensity more disagreeable to others than to themselves. Some individuals, however, require more food than others, probably from a less perfect digestion: this we may observe in many thin persons; whilst, on the contrary, many fat people are small eaters, making the best of their food. But the stomach is often idiopathically affected, pain, distension, sickness, and eructation of wind, or other matters, being the common symptoms. Such symptoms may arise from errors of diet, or from a naturally weak digestion, owing to a fault in the secretions of the organ, or

of the action of its coats themselves. If the gastric juice and pepsine are not healthy, of course fermentations and other decompositions, with the formation of abnormal products as acetic or butyric acid, eructations of gases, and heartburn, or pain, will ensue. There may perhaps be in the stomach a superabundance of the natural acid causing gastrodynia, which food or alkalies may relieve, or the opposite state, which acids may rectify, or violent spasm of the muscular coat, only to be relieved by opium or ether, though the spasm may be often, no doubt, situated in the duodenum or bile-ducts. We have alluded to gastritis, which must be carefully distinguished from pure dyspepsia, as the treatment is the reverse. Frequent vomiting may occur from sympathy with many distant organs—the brain, heart, liver, bowels, kidneys, and uterus. In some cases, particularly in children, it appears to be kept up by habit, or perhaps often by overloading the stomach. Dr. Parry, from his own experience, believes that the fluid in pyrosis comes from the salivary glands, and we find that it strikes a red colour with tincture of steel. Emaciation follows as a matter of course in long continued indigestion.*

By attention to the cause of the disease it may generally be relieved. Excessive exercise or fatigue incapacitates the stomach from performing its function; moderate exertion is necessary. Sedentary habits, too great mental labour, the abuse of stimulants or narcotics, and imperfect mastication, are common causes of the complaint, and of course indigestible diet. Natural debility of the general system, or of the stomach particularly, may be remedied by bitters or quinine; acids in some cases evidently produce an appetite, and assist in digestion. The other chylopoietic functions must be looked to, as that of the liver and bowels; the gouty diathesis, if existing, must be corrected. Change of air, regular exercise, sea-bathing, and a close attention to the quantity

* Forms of free algæ, the yeast plant and sarcina, a similar form to the gonium of the old microscopists, have their habitats in the stomach in some forms of its diseases.

and chemical nature of the aliments, also enter into our category of curative means.

JAUNDICE.

It is probable that there may be what is called an overflow of bile, of which a diarrhœa is the natural cure—perhaps a decreased secretion in other cases, as in dyspepsia, with or without organic disease of the liver ; there is total suppression in cholera, though the ducts remain open. In the various diseases of the liver, if jaundice occur, it must be from default of the separation of the bile from the blood ; in other cases the bile appears to remain in the parenchyma of the liver ; often, however, the obstruction is in the large ducts, most commonly from inspissated bile or gall-stones, the pressure which this organ is subject to during the period of pregnancy, tumours, or accumulations in the duodenum or colon of different natures. Jaundice too, at least yellowness of the skin, is a symptom of serious fevers, and of poisonings, in which cases there probably is inflammation of the stomach, and small intestines, extending to the ducts, and sometimes producing black vomit. Bile may perhaps be absorbed from the gall-bladder, and so produce the disease, but if this should be the sole source of it, the stoppage must be in the cystic duct. Emaciation follows diseases of the liver, as well as those of the stomach.

The symptoms of jaundice are commonly epigastric pain and sickness, the presence of bile or bile pigment in the urine as well as the absence of it in the fæces, yellow skin and itching, or even urticaria. The serum in ascites is often tinged with bile, or at least with its colouring matter. Infants are sometimes affected with the complaint, and it may prove fatal to them. Generally speaking, however, very fortunately, jaundice depends upon removable causes. The discharge of biliary calculi or concretions is promoted by the gentle but continued use of purgatives, or sometimes in a more violent way by a vomit, which, however, often fails. The same treatment may remove some of the other causes

of the disorder. Potass or soap, according to Heberden, did not dissolve calculi (cholesterine), but they do biliary concretions, of which many calculi consist, at least in part. Ether or alcohol would act on the fatty matter. When there are only a few stones in the gall-bladder they are often globular, and composed in part of hard bile, in part of cholesterine, but it is sometimes full of calculi of cholesterine, in which case they are often of a shape approaching the cube. The bile concretions are more irregular in form. Spasm and violent pain are removed by opiates and ether. Inflammation of course requires topical bleeding. The treatment of organic lesions of the liver is another affair, and of the attendant dropsy also; mercury, iodine, taraxacum, acids, muriate of ammonia, and topical appliances of a depletory or irritating nature, are capable in some cases of curing or alleviating these diseases.

CONSTIPATION.

This, when not the result of stricture or mechanical impediment, may perhaps arise from a deficiency of the biliary secretion, or of the nervous energy of the bowels themselves. These are often paralyzed in head affections, or in injury of the spine, and partly so in sedentary persons, or from the abuse of purgatives. A tympanitic state of them may be owing to similar causes, and has been relieved by galvanism; but too often this symptom arises, as well as the preceding, from a more important cause, inflammation, perhaps verging to the loss of their vitality. Remarkable cases of prolonged costiveness are not very uncommon; one, for instance, is recorded by Baillie, of fifteen weeks duration, but this was from stricture, to which the musculo-membranous structure of the large intestines is subject.

COLICA PICTONUM.

The absórption of lead is a common cause of constipation and consequent colic, in those whose employment exposes them to its action; it appears to be difficult to detect in the

blood or urine, but no doubt it enters the circulation, astringes the secreting vessels of the colon, and combines with the muscular and nervous tissues. Bilious vomiting is one of the symptoms of lead poisoning, also colic, with cramps, and pain of the loins; chorea, nervous tremors, sometimes palsies of the cerebral nerves, and epilepsies, with nervous fever, likewise occur. The palsy, however, commonly occurs in those organs which come in contact with the poison, the arms of potters, for instance. In such cases the gums or teeth are discoloured from the effects of the mineral, which is decomposed, by the sulphuretted hydrogen formed about the gums, into an artificial galena.

We are successful in the treatment of lead-poisoning by clearing out the system by means of proper evacuants, by hot sulphureous baths, by relieving the pain produced, and by the use of chemical antidotes, as phosphates or sulphates, or the hydriodate of potass; the phosphate of soda appears a useful medicine as well as prophylactic. Such patients often die rather prematurely of epilepsy and nervous fever.

INTUS-SUSCEPTION, ILEUS.

Invagination of one portion of the intestine into the succeeding lower part is not a very uncommon occurrence. In some cases the portion has been discharged with impunity by an effort of nature, brought about by a process of sloughing, ulceration, and adhesive inflammation. Obstruction and all its lamentable results of enteritis, ulceration, and perforation, may ensue from the lodgment of hardened fæces or indigestible matters, such as a few potato skins, which we have lately seen in a young healthy woman. In some cases inflammation appears to precede the obstruction, paralyzing the muscular coat. We often see, in strangulated hernia, that the bowel though returned and quite free, does not regain its function.

The concretions so frequent in ruminants are less common in man, at least when living on the food which the English use; but more common in such people as consume much

oatmeal. The globular concretions found in the first stomach of ruminants must owe their form to the movements of the organ; they consist within of hair, spirally arranged; dark green and polished externally; we have had two of these from one paunch of the cow. The concretions from the bowels of the horse vary in appearance: some are soft and spongy, like felt, consisting partly of the *paleæ* of the oat upon which the animal has fed, with a woolly matter, and a nail, or some such body for a nucleus; others hard and stony, consisting of phosphates with the same vegetable *paleæ*, some radiate, others concentric and light. The oriental bezoards have for their chief constituent what is termed ellagic acid; the occidental ones are resinous and inflammable.

MELÆNA.

Extravasation of blood into the stomach is no uncommon occurrence, probably, generally from congestion in the portal circulation. It mostly originates in simple exudation from the mucous membrane, or sometimes from the vessels of the stomach or intestines. The altered blood of a very dark colour may be vomited or passed by stool. Such hæmorrhage is often vicarious with the menses. In some cases hæmorrhage from the stomach or bowels attends purpura or fever, and is then of a more serious character. The cause understood, the treatment appears to be plain.

VERMINATION.

Tape-worm, tænia solium, certainly often affects butchers, but has been observed in an individual who never ate flesh. Amongst other symptoms are sleepless nights, and an internal sense of movement. It is well known that there are two kinds of jointed worm affecting man, the one mentioned above, and bothriocephalus latus, or broad tape-worm,* the latter rarely seen in England except in sailors from the opposite side of the channel; the orientals are said to be subject to it: it has not the anterior terminal disc, with

* For a figure see Owen's "Lectures on the Invertebrata."

two rows of recurved spines and four pores, seen in the former, but a simpler organization about the mouth. We have specimens of both kinds of jointed worm from the cat and dog,* but they are described as different from those of man.

The ova of these creatures must be commonly introduced from without, but are only developed in their proper *habitats* in which we find them, and never without the body. The presence of some other parasites within the tissues of the body is more difficult to explain; we may suppose hydatids to be animated cells, but other entozoa must have the power of perforating the substance of the body (which, indeed, many evidently have), or their ova must be so minute as to be admissible into the vessels. Individuals visiting another country and becoming infested with the tape-worm, will have the species peculiar to the country where they have visited, a proof that the ova are received from without.

The large round worm, ascaris lumbricoides, appears sometimes to produce convulsions in children, by irritation and reflex action. Those infesting the horse are smaller. We have seen the filaria Medinensis in the *dorsum* of the foot, of an English lady who had been on the Guinea coast; another small species of filaria has been detected in the human eye, and another is often found in that of the horse. We have seen one on the stomach of the sepia, and this genus or strongylus is often found in the bronchi, occasionally in man, but abounding in the calf, and apparently viviparous; also in the trachea of poultry, &c., producing serious diseases. The giant strongylus of the human kidney was described by Blasius in 1687. The long thread-worm, trichocephalus, affects the cœcum and colon, and another minute species of ascaris (vermicularis) the rectum, producing much irritation. To these must be added the spiropteris voided from the bladder, and the trichina spiralis of the muscles.

There is a peculiar family of entozoa with one or more

* The tape-worm may produce death in the dog by causing obstruction —also paralysis of the hinder legs.

terminal or ventral pores or suckers, and, like the tape-worm, having no distinct intestinal canal, nor a head : the fluke of the gall bladder, distoma hepaticum, is one of these, and a polystoma has also been found in the human subject. A distoma is found in the ovary of the pond-mussel. Of the hydatid entozoa one, cysticercus, affects the muscles, or even the interior of the eye, and others, more or less approaching to the simple cyst, have occurred in many parts of the human body.

Diseases of General Assimilation.—Cachexiæ of Sauvages.

On the healthy action of the minute nutrient vessels depends the growth of the body, and the proper organization of its tissues; their weak state, on the contrary, gives rise to various diseases and morbid products.

ATROPHY AND HYPERTROPHY.

Emaciation may take place either from a cessation of nutrition or an increase of absorption, or from both conjoined : the fat of the body is the first to disappear ; being laid up, in many animals, in a variety of curious situations, as a provision for the temporary cessations in their assimilative function. Many organs are subject to what is particularly called atrophy or hypertrophy, from failure or excess of the growth of such parts. But what is more curious, we often see one tissue substituted for another, or generated in an unnatural manner, owing to causes of derangement in the system.

FATTY DEGENERACY.

Diffused or infiltrated fat is often deposited in organs, in a state of debility or malassimilation, or of inflammation, sometimes in the liver, kidneys, muscles, or heart, in which last case it is concomitant with a weakness of its action, and consequently sometimes may cause the complaint called angina pectoris. This degeneracy is believed to cause the appearance called arca senilis, in the iris of people advanc-

ing in life. It is also sometimes present in the bones, and, as at the same time their natural tissues are diminished, they become brittle.*

FRAGILITAS OSSIUM, RACHITIS, MOLLITIES OSSIUM.

This brittleness of the bones is a common state in old age and in cancer, and doubtless occurs in other cachexies, or from want of exercise, even in the young. A soft state of the bones produces the rickets of children, arising from hereditary weak organization, such children being perhaps the last born of the family; also from improper food, and weak assimilation; in this case, as well as in the softening of the bones occurring in adults, the phosphate of lime is too small in quantity. In the last case the absorbents are probably in fault, as the phosphates are found in excess in the urine, apparently unduly thrown out of the system; but according to Mr. Paget even these cases, at least in England, have been attended with fatty infiltration. In rickets the bones become large and very strong, when the complaint is outgrown. The disease affects animals. Glisson was one of the first to describe it, and it was formerly considered peculiar to England. Remarkable cases of bone-softening are on record, as that of Madame Supiot, or that of the prophet, Abulfeda, in the time of Mohamed, the latter instance a sufficient proof that this variety of the disease at least has long existed, whether described or not. The former individual had a fondness for salt, which has also been supposed to do mischief in rickets. Dissolved in water this substance, as well as lactic acid, becomes a solvent of phosphate of lime; hence it is found in the urine, and, as mentioned before, in the pus around diseased bone. One old lady, who was the subject of bone-softening, had long been under the necessity of using

* Some have supposed this curious change to be purely a chemical one—that muscle, for instance, is changed into fatty matter in the body, as it is into adipocire out of the body, but we would rather suppose this degeneration to be the result of a vital but morbid action of the absorbent and formative capillaries.

opiates, but perhaps debility and a scrofulous taint, bad air, damp, and errors in diet, are sufficient to account for the disease. Curved spine is one unfortunate result of such a debility of the system. The phosphate of lime of the bones is derived from the food directly, and its exhibition might be useful in some cases, but commonly no doubt the complaint lies deeper, with no deficiency of pabulum for the formation of bone, but with too much debility in the formative vessels to use it. Besides fat, many other normal tissues of the body are often deposited in abnormal situations, infiltrated as just described in the case of fat, or collected into distinct tumours—bone, for instance, or cartilage, epithelium, nervous tissue, and pigmentum, &c.

SCROFULA.

But scrofula is the great disease of assimilation or nutrition, originating often in a weakness of the race, and therefore congenital. It is generated by all the debilitating circumstances of hyper-civilization, bad air, bad diet, over work, late hours, indulgence, in fact, by all that weakens the race or the individual. Probably there are few families, in some one or more of which, more or less of the disease may not be observed. When strongly manifested it is almost certainly entailed on the offspring, but does not seem communicable by inoculation, and therefore is probably a disease of the tissues and not of the fluids. It is generally attended with a delicacy of conformation, xanthic complexion and hair, transparency of tissues, and thin skin. It is shown particularly in enlarged, inflamed, and tubercular glands, ulcerations of the skin, producing often a species of lupus, abscesses, diseases of the membranes, eye, joints, and bones. Often the tuberculosis, so characteristic of the disease, affects the lungs or mesenteric glands, and phthisis or tabes ensues The tissues of the body being weak, and with low powers of restoration, slight injuries often produce serious results. Enlarged glands in the neck are often seen, sometimes without any local cause of irritation, at other times a carious

tooth, enlarged tonsil, inflamed cornea or tarsi, eruptions near the nose or ear, or on the scalp, or otorrhœa, may apparently be the exciting cause. Scrofulous inflammation is slow, and not always very painful. With respect to the tubercles which accompany the disease in many organs, they appear, like cancer or melanosis, to be distinct organizations, somewhat like parasites, but how they originate, and where, in the capillaries or in the lymphatics, is doubtful. They have been considered to be particularly due to arterial action, and indeed incompatible with a venous diathesis, which supposed fact however some might call in question.

Scrofula being caused by, or at least originating in, a state of debility, its remedy must be all that invigorates in medicine, diet, air, &c., and such is found to be the case in practice. Though indigestion alone will not cause it, yet attention to the chylopoietic organs must be one of the first steps in the cure of it. It is reported on good authority that of the members of a family one-half lived on meagre diet and watery beverages, and became affected with strumous swellings and sores, whilst the rest, fed with animal food and fermented drinks, remained healthy. This would bring us more closely to the cause, innutritious, rather than luxurious diet, poverty rather than affluence. Iodine appears to have considerable power to remove the morbid products of scrofula; fish-oil, chalybeates, and quinine, are also amongst our best remedies in the disease.

BRONCHOCELE.

Bronchocele or *goitre* is an obscure disease, a vascular hypertrophy, or encysted or melicerous tumour of an organ, itself obscure as to its function. It affects almost all the females of some families, in some parts of Derbyshire and Staffordshire, and prevails in Buckinghamshire and Surrey, and indeed in many parts of the world. It often appears about puberty, when those glandular organs the breasts also enlarge; it is increased in pregnancy, and also during suckling, or as patients date it, from the straining in labour. It

also appears to cause or attend a fulness of blood upwards. It has been supposed that peculiarity of climate, and calcareous impurity in water, cause it to be endemic in some districts. The disease is very common in the valley of the Rhine, and it has been denied by some that the waters are there subject to impurity, but in some of the tributaries in the side valleys where the disease abounds, near Sitten, the streams are certainly very little different from lime-wash in colour. This strong impurity however is not always present where the disease abounds, neither do all goitrous races, as Humboldt observes, live in low damp valleys, as has been maintained.

We should infer that the disease is one of a particular constitution and formation of body, probably brought about by peculiarity of district, of which the calcareous or barytic impurity of water may be one, but that the thyroid has also some analogy, or connexion, or sympathy, with the mammæ or sexual system, and that their changes may affect it, it being rare except in the female, and commonly originating at puberty, and increasing when those organs are in a disturbed state.

This complaint is sometimes associated with the cretinism of the Alps or the cagotism of the Pyrenees, a strong degeneracy of the race, accompanied by idiotism, and an inordinate growth of the cranium.

PHTHISIS PULMONALIS.

Tubercles, when deposited in the lungs, produce a disastrous result, although they may remain latent for many years; they probably often exist at birth. Unlike pneumonia, the disease most commonly affects the summit of the lungs. When the tubercles put on diseased action, symptoms of chronic inflammation and disorganization supervene. The physician can ascertain the existence of the seeds of the malady, and our art has probably power, in many cases, to prevent or retard its full development. Doubtless a proper expansion and exercise of the lungs by various means, con-

joined with a continued tonic treatment, would be found a preventative and curative agent of great power. The removal of the causes producing debility and scrofulous *diathesis*, the moderate use of iodine to cause absorption of the tubercles in their incipient stage, a variety of tonics, as in scrofula, particularly fish-oil and steel, and a happier climate, are the best remedies. Besides exercise of the lungs, great attention to the functions of the skin, to the healthy action of the digestive system, and to the regular gentle peristaltic action and secretions of the bowels, would appear to be remedies, or at least prophylactics of much consequence.

It is evident that the disease is, like scrofula, more dependent upon congenital weakness than upon any extraneous cause, though such influences commonly elicit the hereditary tendency. A removal to a better climate delays or prevents the softening or suppuration of the tubercles—to a worse as surely hastens it. The higher mammalia from warm climates, when placed in *menageries* in this country, often die of tuberculosis, though Mr. Simon somewhat restricts this fact. Dry grinders, millers, porcelain scourers, and other persons employed in such dusty work, soon fall victims to this disease, or to chronic bronchitis, or pneumonia. The smoke and gases of manufacturing districts appear rather to cause these last diseases, and that in individuals advanced in middle life. The constitutional symptoms of phthisis form but a repetition of those of hectic fever.

As the disease advances the pleura may be perforated by the ulceration, and air escape into the cavity of the chest; sudden pain, sense of something giving way, and dyspnœa, occurring in the course of the disease, would show this fact, especially the physical signs on percussion and auscultation.

The calcareous concretions sometimes found in the lungs, where there have been tubercular excavations, or in fact expectorated, present, when examined microscopically, the appearance of molecular motion, first described in the particles of bodies by Mr. Brown.

SCIRRHUS AND CANCER.

Scirrhus is a tumour originating in a malignant perversion of nutrition, and apparently of a somewhat parasitical character. It is generally dubious and unsatisfactory to attempt to eradicate it, perhaps on account of this half vegetative growth, and also from the system being sown with the germs of the same disease. The dangerous gangrene produced by the caustic of the empirics has, in some cases, caused, by its own over-action, the death of the tumour, and of the germinating power of the fibres which the knife may sometimes leave. This view of the parasitic nature of these tumours is favoured by their microscopic character, presenting the appearance of nucleated cells, enclosing granular matter and sporules. Langenbeck injected cancerous matter into the veins of a dog, and apparently produced the disease. Dr. Watson knew instances where cancer occurred in males, whose wives were affected with uterine carcinoma, but such cases are probably the exception and not the rule. The female, possibly from her more generative and nutrient constitution, appears more disposed to cancer than the male, and nearly half such cases occur between the ages of forty and fifty, and commonly make their appearance in the breast or uterus. Cancer is certainly hereditary, but does not always appear under the same form or variety.

EPITHELIAL CANCER.

But the disease may arise in any individual and in any part, as in the lip, often from the irritation of the pipe, or in the scrotum of sweeps, in an old scar or cicatrix, or from external injury: in a sweep, who presented only a small soot-pustule externally, we found a fungoid disease of the bladder, which had proved the cause of death. In such cases the mucous membranes as well as the skin would appear to be liable to the disease, and perhaps something more than local irritation occurs as its cause.

Mr. Paget observes that soot-cancer does not affect colliers,

and it must therefore be probably the ammonia of the soot which gives rise to the disease. Epithelial cancer is most common in old age. Paget and Walshe have shown, what agrees with the experience of most surgeons, that the prognosis of malignant tumours of all sorts, either with or without excision, is unfavourable; the sallow complexion shows the cachexy present in the system, and the blood is infected by the diseased fluids or germs Lupus appears manageable in some forms, in others equally virulent with epithelial cancer.

SOFT CANCER.

This when cut into presents an appearance very like that of brain; it is hence called encephaloid, or, in the ulcerated state, fungus hæmatodes. According to Paget it particularly localizes itself in the bones, eye-ball, and intermuscular spaces, and frequently occurs in early life.

We have now a case of this terrible disease, a mass of fungus protruding from the eye, in a young child three years old; four months since the only appearance was great dilatation of the pupil, and a white nacreous appearance at the bottom of the eye.

MELANOSIS, ETC.

In melanosis we have a tumour in which an unnatural deposit of pigment is one of the characteristics; it is not uncommon in the eye, the principal natural situation of such matter in man; we have found a large tumour of this sort behind the peritoneum, above the left kidney. Melanosis is common in the horse, especially in white ones. It, and osteosarcoma, and colloid, or bone and cartilage cancer, are all malignant forms of disease, though bone as well as cartilage is not unfrequently morbidly deposited in the body, under a less serious aspect, in enchondroma, for instance, forming the curious nodulated swellings sometimes seen on the fingers.

STEATOMA.

Fatty tumour, or steatoma, and most varieties of sarcoma, seldom prove anything but benign ; the latter term, sarcoma, is rather incorrect, for true muscular fibre does not form a part of tumours, its existence seeming to depend upon its proper exercise. In the round cysts of a sero-cellular tumour which we lately removed from the breast of a sallow young female, we noticed the rhomboid plates of cholestrine, as well as in another from the brow, the latter having also the rudimentary hairs often found in such cysts. Tumours are notoriously difficult to disperse by means of medicine : we have succeeded several times in getting rid of small ones by subcutaneous incision, passing a tenotomy-knife two or three times horizontally through them, after which they have, in the course of a little time, been absorbed.

Elephantiasis Græcorum.—E. Arabica of Good.

The elephantiasis of the Greeks (judham or juzam), probably claims a place near scrofula. From the accounts we have of it by Drs. Johnson, Robinson, Adams, and others, it appears to be hereditary, but not contagious, to consist in a cachexy probably produced by wretched diet, stale or salt fish, want of vegetable food, uncleanliness, exposure to damp and cold, &c., in fact, by such causes as prevailed, and perhaps caused the same disease in our forefathers, in this country, in the ages when lepers and leper-houses were spread over it.* In India it particularly affects dobys and mollies (washerwomen and gardeners). The degeneration affects first the skin, causing it to become coarse, discoloured, fissured, and covered with tubercles, and white shining insensible patches appear on it. A scaly formation affects it, particularly about the nails, which also break off, and the hair of the eyebrows, &c., also drops off; the features become swollen and misshapen, the fingers and toes, or even the feet

* There are some interesting remarks on this subject in White's "Selborne."

and hands, are lost by a species of ulceration : the glands are often affected, the voice becomes hoarse, and the mucous membrane of the nostrils changed. In other respects the general health may continue good, but the mind often becomes torpid. The urine presents an unnatural odour. The large or small limbs may be swollen at an early stage of the disease, but not as in the following affection, bucnemia. The complaint affects women less than men, and is known, under mild forms, in Spain, Italy, Norway, Iceland, and the Crimea, as well as in a worse throughout the East generally; also at Madeira, Mauritius, and in the New World. The disease became extinct in the Shetland Isles as late as 1736. Few diseases are probably perfectly *sui generis* (except in nosologies); at any rate they have very different degrees and symptoms, and some forms of scrofula, or scrofulous skin disease, appear to have a resemblance to this complaint, as bad cases of cellulitis affecting the lower extremity may to the following.

BUCNEMIA, ELEPHANT, OR BARBADOES, OR COCHIN-LEG.

This complaint, called by various names, from the countries or races subject to it, or the objects which it is supposed to resemble, is also called the elephantiasis of the Arabs, but is probably their dal-fil. It is seen in most of the warmer parts of the globe, in Polynesia, the Eastern Archipelago, Japan, South America, Malabar, Egypt, Arabia, and Spain. Rhazes described it in the ninth century. It is essentially a hypertrophy of the cellular tissues, more particularly of the leg, but also affecting other parts of the body in tropical countries, as the scrotum, abdomen, or arm. The elephantiasis of the Greeks had its name from the greatness and frightful nature of the malady, this from the resemblance the diseased leg has to that of the elephant. The disease is attended by constitutional disturbance in some cases, and has been considered to be in a great measure due to disorder of the lymphatics.

LEPRA.

At the time when elephantiasis (of the Greeks) was so prevalent in Europe, it was commonly called the leprosy, as it is now indeed so considered in several countries; but that accomplished orientalist and pious physician, Dr. Good, has shown, apparently, that the so-called Mosaic diseases were indeed malignant species of the true lepra, as we now know it, and that they are still known to the Arabs by names not very different from the Hebrew ones, that for the common leprosy continuing the same. Dr. Good has also shown that whilst elephantiasis was mistaken for the biblical and malignant leprosy in the west, leprosy was considered to be an incipient form of elephantiasis Græcorum by the Arab writers, whilst the Greeks chose to misappropriate certain of the oriental terms, as psora, to other diseases.

Diseases of the Circulating System, and of the Blood. —Hæmatica.

SCORBUTUS.

We have already alluded to the morbid state of the blood in this disease and in purpura. Sea-scurvy is evidently principally brought about by the food being charged with muriate of soda, and *minus* a due admixture of fresh vegetable matter. In such cases Mead and Huxham observed the blood when drawn to be thin and black, and after standing to become thicker, but to show no proper coagulation, and turning to a dark muddy colour with a greenish surface, and then quite black. The symptoms consist of purple blotches of the skin, extravasation of the fluid blood, and hæmorrhage from various organs—the circulating fluid having apparently lost its coagulating, reparative, and formative powers. Land-scurvy, so prevalent of late years, presents similar symptoms, and both are cured by succulent vegetable food, lemon juice, astringents, spruce, turpentine, and pure water. It is observed by Huxham that scorbutus

was produced by the use of Mr. Stevens's alkaline remedy for the gout, which statement, if correct, would contra-indicate the administration of potass. Purpura appears not quite identical, nor yielding to the same remedies; the viscera are thought more at fault, and the external vibices of the legs appear often brought on by cold applied to the parts. A warm temperature, good ventilation, and a cheerful state of the mind, are found to have great effect in the management or prevention of sea-scurvy.

We appear to be indebted to Cook and Sir G. Blane for the extinction of scorbutus in the navy. The spleen in these cases appears to be often enlarged. Mead, for instance, found it larger than the liver.

In anæmia, chlorosis, &c., the microscopists tell us that there is a deficiency of red discs in the blood, and in some cases of visceral enlargement a superabundance of the colourless ones (leucocythæmia). There is a similar fault in some cases of scrofula, diabetes, albuminuria, marsh-cachexy, lead-poisoning, starvation, &c. In rheumatism the fibrine appears to be in excess, and lactic acid is probably present in considerable quantity, and the former case occurs in other inflammatory diseases ; fibrine is not at all deficient in chlorosis. Its albumen is lessened in dropsy, and in Bright's disease. Its fat is often increased after meals and in derangements of the liver and kidney. The salts of the blood are considered to be lessened in inflammation, but increased in fevers, in the exanthemata, in Bright's disease, and dropsies. The water must be diminished in cholera.

DELIRIUM TREMENS.

If the modern view respecting this affection be correct, it may be placed here. It was formerly considered to be an arachnitis or at least an inflammatory affection of the brain, and no doubt was often successfully treated as such,* but such true inflammatory action is not generally present, the complaint being rather one of excessive irritation, and this

* Guy's Hospital Reports.

from the effect of a poison (alcohol) producing a depraved state of the blood and tissues.

Strictly speaking, then, this affection is not a real disease, but the effect of an artificial poison in the blood, according to which theory it is now treated with a very favourable result.

Though the nervous system suffers most in this affection, the vascular is also much disordered; we have great tremors in the voluntary muscles, strange deceptions of the senses, and hallucinations, with loss of sleep. These hallucinations are liable to increase into sudden and violent paroxysms, sometimes dangerous to the patient or his friends, but more frequently of a harmless or timorous description. Probably in no other mental disease is there such a perfect perversion of the intellectual faculties, but less so of many of the moral feelings. The pulse is generally rapid and the head and face bathed in a cold perspiration. Epilepsy is often a serious complication. The disease is apt to take place in its unfortunate victim on the occurrence of any accident or injury, and, it is thought, also upon suddenly withdrawing the accustomed stimulants.

The treatment which is found most successful is to rid the system as much as possible of the alcoholic poison by brisk purgatives, but especially to produce sleep, by the substitution of another stimulant and narcotic in the place of the one withdrawn,—opium, which often acts like a charm, restoring to reason in a few hours those whose actions before were truly maniacal.

GOUT.

The modern medico-chemical doctrines attribute gout and rheumatism to the prevalence of a morbid principle, or poison as it is sometimes called, in the blood, or rather perhaps in the tissues: but the question is whether this principle be a cause or an effect; there appears to be also an excess of nutritive action, or what is tantamount, a diminution of excretion, and this being attendant upon a particular

hereditary organization, and causing, it may be, the redundance of urea or urates in the system, which some suppose to constitute the above morbid principle. Urates abound in the urine, and are deposited about the joints. Low diet and free exercise commonly prevent its access. Gout does not, as supposed, indemnify the individual from other diseases, delirium tremens, epilepsy, apoplexy, angina pectoris, and other affections, often supervening ;* it even appears to bring many complaints in its train, yet it certainly often jealously disputes for supremacy with them, and its subsidence or retrocession is sometimes dangerous to the brain or other great organs. It has a remarkable tendency to seize upon the foot or great toe, why, it seems difficult to say. Heberden notices that the pain is often worse after the first sleep. The digestive organs are certainly often at fault in this affection, digestion being attended with the formation of much acid. Besides attention to these organs the treatment is, as might be inferred from the theory, mainly evacuant. Colchicum appears to have an anodyne effect, and also the power of unloading the small intestines of their superabundant nutrient matter, and of increasing the secretion of bile ; there is good evidence in favour of bleeding in moderation in some cases, but neither this, nor depletion of any sort, is commonly very willingly submitted to by the luxurious patients, who indeed sometimes require a more tonic and stimulating treatment.

ACUTE RHEUMATISM.

This disease is also now considered to be one of the blood, as above stated, and lactic acid rather than the uric, as the *materies morbi*, finds advocates in most recent observers, as Todd, Williams, and Fuller. This acid, according to Berzelius, exists in healthy perspiration, and it abounds in that of acute rheumatism, so as to turn litmus-paper red. Some may however still consider the proximate cause of the complaint to consist primarily of an inflammatory action of the

* The illustrious Sydenham suffered both from gout and calculus.

muscles and fibrous structures connected with them, and to place it, with Cullen, amongst the phlegmasiæ. Others, again, may consider the disease to be rather of the arterial system itself, than of the contents of the vessels: inflammation of the heart and large vessels constituting one of the most dangerous complications of the disease, only discovered and elucidated in our own times; and it is fortunate that we can ascertain this attendant of the disease, at an early stage, by auscultation, and so resist the ingress of an incurable or at least very dangerous lesion. The above morbid chemical actions, as well as the formation of fibrine in the system, and of uric acid by the kidneys, are perhaps only of a secondary nature; however this may be, the constitution in such cases appears deeply affected, and the complaint is even thought to be hereditary like gout. Indigestion also, and more particularly the suppression of perspiration, are common causes of the complaint; also too great muscular exertion. Acute rheumatism is attended with great fever, violent perspiration,* severe pains and inflammations in various fibrous or muscular parts, particularly the joints, and it is peculiarly subject, so long as the disease is acute, to change of seat or *metastasis.* We have also a white tongue, highly coloured urine, and strong pulse. Such symptoms we see in the young and middle-aged; in the older subject the complaint is different and less dangerous, but the joints are often seriously impeded in their functions by degeneration of their tissues. This chronic form we see very generally in countrymen, and those who have been much exposed to vicissitudes of weather, with hard labour.

Alkalies and colchicum appear efficacious in acute rheumatism as in gout, also sharp purgatives and the antiphlogistic treatment: such depletion is commonly sufficiently powerful without bleeding, which often appears to add to the irritability of the arterial system. Narcotics, as opium,

* According to Hecker the sweating sickness was a superlative variety of rheumatic fever.

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conium, Dover's powder, or belladonna, combined with calomel or not, are valuable remedies. Iodide of potass may help to disperse the swellings, with other *adjuvantia*, and quinine may materially aid in the final cure. Lemon-juice has been recommended upon theory, and also nitrate of potass, in large doses, from its power of preventing the coagulation of the blood, and consequently, it is supposed, the injurious deposit of fibrine.* Alkaline baths and fomentations are now recommended on chemical views.

PLETHORA.

In plethora the blood is too plentiful, causing dangerous symptoms, a state which some unreasonably deny the existence of; and after middle life the venous diathesis appears to preponderate over the arterial, disposing to varix, ulcer, passive hæmorrhage, fistula, &c.

ANÆMIA.

Various states of the system attended with this phenomenon have been alluded to. Light appears to have some effect on the coloration of the blood: thus, individuals inhabiting gloomy abodes, and miners, are often very pale, and some curious cases of excess in this effect in the case of miners are recorded by Chomel.† The symptoms produced by lack of blood, or by its too watery state, are—fainting and sighing, palpitation and throbbing of the arteries, producing a thrill in their course which is audible by means of the stethoscope, sometimes to the patient himself, or even perceptible to the touch, headache and sounds in the ears, dyspnœa, pallor, and anasarca, the last from the wateriness of the blood; also distressed repose. The rationale of these complaints, as they are often seen in young females, after the age of puberty, is still a desideratum. Sometimes there is an unnatural tendency to fat in the blood (oligæmia), as well as in the system, or in some particular organ. A species of phlegmasia dolens may be seen occasionally in some of these cases, as well as

* Simon, Gen. Pathology.

† Dict. de Medicine.

the affection of the legs called erythema nodosa. Carbonate of iron appears to be a good chalybeate in anæmic cases.

HEART DISEASE.

The local lesions of the circulatory system may be trifling in extent, yet very important and serious in their results. Thus ossification situated in the nutrient arteries of the heart itself, may produce angina pectoris, first distinctly described by Heberden in 1768, or if the deposit be in the aortic valves, hypertrophy of the muscular portion of the heart with or without dilatation, an effort indeed of nature to overcome the obstacle; also from the course of the blood being impeded, engorgement of the lungs, and pulmonary hæmorrhage as well as spasmodic asthma. No mechanical cause of the above nature, however, may be necessary to produce hypertrophy, the stronger passions or violent exercise, for instance, may do it. Of course any impediment to the circulation through the lungs may be an extraneous cause of cardiac disease, as the latter may be, as just observed, of pulmonary affections—such causes of heart affection are phthisis, chronic catarrh, or congenital narrowness of the chest. Blood regurgitating from any impediment to either ventricle, may dilate the corresponding auricle, or the effect may be further extended, and regurgitation from the left side, the left auriculo-ventricular opening (mitral valves) being diseased, may cause dilatation of the right ventricle. If the same mitral valve is contracted, the corresponding ventricle being ill supplied is diminished in size, and in this case, as well as in obstruction of the left aortic valves, the pulse also must be small from deficient supply, whilst on the contrary apoplexy may take place in the lungs. Dilatation may be conjoined with increased thickness of the parietes of a ventricle, particularly if the cause is such as to produce a constant plethora of the cavity, or a ventricle may have its walls concentrically thickened and contracted, when its opening of supply is very narrow. The cavities may in many instances be dilated and their walls at the same time thinned.

These are amongst many observations of the same sort which the industry of modern pathologists have made out, and which we have neither the space, experience, nor ability, to describe or indicate in this pathological sketch.

The tissue of the brain and lungs may suffer, either from the arterial impulse in cases of hypertrophy, or from venous engorgement arising from an impediment to the returning column of blood from these organs. Apoplexy, of course then, may be a result in the former cases, and also congestion or dropsy, but more generally from the impediment to the venous circulation. Dyspnœa and cough, hæmorrhage from the lungs or nose, head symptoms of various sorts, lividity and turgescence of the veins, are also symptoms in these diseases. The physical or stethoscopic signs in diseases of the heart are of course much varied. No doubt that hypertrophy, or at least over-action of the heart, without other mechanical lesion, often occurs, and is often cured. Laennec and Hope have also shown that even when seriously advanced hypertrophy may apparently be sometimes cured, or at least be kept from increasing, by judicious medical means, and by self-denial on the part of the patient.

DROPSY.

We may have dropsy, or rather inflammatory effusion, from over-action of the vascular system in the brain (acute hydrocephalus), pleura, pericardium, peritoneum, ovary, and scrotum, but it may take place in the same organs from obstructions in the circulation, when the derangement is more entitled to the name of dropsy; thus we have ascites or effusion into the abdomen from obstruction of the vena porta in the liver, hydrothorax or water in the chest from the blood not circulating freely through the lungs, hydropericardium in the heart-bag, general anasarca from heart disease, or local dropsy, œdema (in the arm, for instance), from some pressure on the vessels. The diagnosis of some of these cases may require close attention, as dropsy of the pericardium, for instance. There are other causes of general dropsy of a very different nature: thus it occurs, as observed

before, after eruptive diseases, or from exposure to cold. In this case, the skin and the kidneys being vicarious in their function, the latter organs are incited to increased action, and become congested or inflamed, causing the presence of albumen in the urine. In Bright's disease the kidneys may be primarily affected, and anasarca be produced secondarily.* Dropsy is well named from the organ whose disease produces it—cardiac, hepatic, renal, &c.

The treatment of dropsies must, of course, be very different, and it has exercised the tact and skill of the most eminent practitioners, so that it scarcely becomes us to allude to it. The treatment of inflammatory dropsy must be the reverse of that of the cachectic—depletive, antiphlogistic, and sedative, with foxglove, and in some cases mercury ; also attention to restore the action of the skin, and relieve the kidneys or other organs which are suffering. We do not include here inflammatory effusions from local inflammations, as those of pleurisy or peritonitis, but what are considered to be inflammatory anasarcas. In cachectic dropsy we endeavour to diminish the cause of obstruction, or support the patient with tonics, whilst we act on the excreting or absorbing system. Some remedies excite the absorbents to drink up, as it were, the exhaled fluid, as iodine, mercury, or galvanism ; diuretics or hydrogogue cathartics, as jalap, cream of tartar, or elaterium, may cause its disappearance in other ways—unloading the capillaries through the kidneys or bowels, and so causing them to absorb more rapidly by a sort of endosmosis.

Diseases of the Secreting System.—Eccritica.

DIABETES.

Many of the diseases which might be arranged under this head, as diabetes, albuminuria, suppression of urine, calculus,

* Disease of the kidney does not necessarily render the patient dropsical, and Bright's disease embraces several pathological states of the organ.

&c., are touched upon more or less in other places: in the first-named disease the symptoms are pain in the region of the kidneys and spine, and the former organs have been found engorged after death; the mouth and tongue are disordered and rough; the system appears to be in an acid state; the appetite bad, though often at first ravenous; the thirst great. There is vomiting of the acid contents of the stomach, also pain in this organ, and the bowels are costive: there is often local irritation in the external urinary organs. The head is often affected as in anæmia; emaciation, debility, and anasarca, eventually occur. The halitus of the lungs and skin is unhealthy The latter, however, is commonly dry, though strong perspirations may occur occasionally. Rollo considered the stomach to be at fault, others the kidneys, Willis the blood itself, and this from malassimilation, Mead the liver, and the researches of Bernard seem to strengthen this opinion, insomuch as they show that this organ can change the albuminous substances of the blood or food into sugar. It often supervenes upon exposure to cold, or after large draughts of cold drinks taken when the system is in an over-heated state. Dr. Lubbock supposed that the elements of the suppressed perspiration go to form the sugar. The complaint appears sometimes to be hereditary, and it attacks children as well as adults. It was described by Aretæus, but Willis first discovered that sugar exists in the urine.

Diseases of the Respiratory System.—Pneumatica.

APHONIA.

Many of the diseases of this system have also already been glanced at; a few affections may be added here. Aphonia or loss of laryngeal voice sometimes occurs in hysterical and weak individuals, so as to continue for months in spite of remedies, yet as in the case of other half-fancied incapabilities, which such persons labour under, it will suddenly disappear, often during a little exertion or excitement of the mind.

LARYNGITIS.

True inflammation of the larynx is a very serious matter, requiring to be subdued at almost any expense to the system, or else it is necessarily fatal in a short space of time. The great Washington died of this disease, and it has been actively canvassed whether, in the case of an old man like him, the above rule of practice should not have been much relaxed ; he was a hero, and certainly in his last hours appears to have been treated heroically.

LARYNGISMUS STRIDULUS.

Laryngismus, a spasmodic affection of the larynx, described of late years for the first time, often occurs in very young children, and is attended with an occasional crowing noise during inspiration, particularly when a crying fit occurs, and danger of instant suffocation is the result. It sometimes appears to arise from disorder of the bowels, as diarrhœa, or the irritation of teething. The feet and hands are often affected with spasms, the flexors of the toes and fingers being much contracted, and this also appears to be attended by a degree of œdema. The complaint evidently occurs to a less extent in grown people of a nervous and hysterical constitution. From Dr. Reid's experiments it appears that the inferior laryngeal nerve is principally implicated in this state.

CYNANCHE TRACHEALIS.

Children but too often succumb from croup, a plastic inflammation of the trachea, attended with the formation of a false membrane. A vapour-bath has been recommended in the treatment of this disease, and it appears to answer better in many cases than the usual treatment—bleeding, calomel, blisters, emetics, &c.

A sort of nocturnal croup frequently attacks children, and is of a less dangerous character. It comes on often in cold winter nights, when their dormitories become of a low tem-

perature, or if they have been more exposed in a walk during the day than usual. It may lead to true croup, but generally disappears in a few hours, by means of warm drinks, a hot bath, or antimonials.

DIPHTHERIA.

Lastly, besides the above diseases, and the malignant sore throat of scarlatina, there appears to be a distinct form of disease, as described by Bretonneau and Guersent, also affecting children, living in unhealthy and particularly in damp localities, as on the banks of rivers or in low meadows. It consists in a plastic inflammation of the throat, particularly the fauces and tonsils, and appears to be contagious, at least it often destroys several of a family at the same time. Phagedæna of the mouth (stomatitis) is also a serious affection of ill-conditioned children.

SPASMODIC ASTHMA.

Asthma appears to be purely a spasmodic disease, attendant on some peculiar conformation of the chest, or lungs, or heart. It is often concomitant also with pulmonary emphysema. The bronchi have been shown by the observations of Reissessen, and the experiments of Dr. Williams, to be muscular, and this being the case we need not wonder that asthma is produced in the same remarkable way as other nervous and spasmodic phenomena are. Asthma has occurred from exostosis of the thoracic vertebræ pressing upon the nerves. Common causes of the fits are the effluvium of hay or of ipecacuanha, and other smells, particular states of the air, acrid dust as oxide of zinc, mental disturbance as laughter, or reflex nerve action from a variety of irritations. But pure spasmodic asthma must be distinguished from congestive or inflammatory dyspnœa or bronchitis. In asthma, though the action of the external muscles is increased, the vesicular respiration of the lungs appears to cease more or less, from spasm and the influx of mucus.

In pure asthma, besides attending to the peculiarities of

the system, and placing it in the most advantageous state, a variety of anti-spasmodic, expectorant, and other medicines, are of use. Belladonna and stramonium were found in some of the physiological experiments above alluded to, to affect the bronchial contractility ; and the breathing of the smoke of stramonium is often of the greatest benefit, but then it should be inhaled and not simply smoked, the leaf being placed upon a hot coin in a cup, and the lungs carefully filled a few times with the smoke.

EMPHYSEMA PULMONUM.

Emphysema of the lungs is a breaking down of the partitions between the air-cells, or at least an enlargement of the latter, and more rarely an intercellular infiltration of air, occurring commonly from the straining of the organs in chronic cough; hence it is especially seen in old people, such as are commonly called asthmatic. The stethoscope, in conjunction with percussion, curiously detects the disease ; the former shows that there is little true respiratory murmur, the air not passing through the parts but stagnant therein, whilst the latter shows by the sonorous sound that air exists to an unusual extent at the point percussed. The complaint has particularly engaged the attention of medical men in our days, but it was described in both man and animals by Sir J. Floyer, of Lichfield, one hundred and fifty years back.

CELLULAR EMPHYSEMA.

Spontaneous emphysema of the body sometimes occurs, the air escaping in some manner from the lungs into the cellular tissue; it has been noticed in phthisis, and after strong muscular efforts; we have seen it lately to occur during labour, affecting the whole upper half of the body, but only producing a little temporary inconvenience. Emphysema in itself is therefore not serious, and has even, it is said, been practised on animals to promote their fattening. It has been questioned how the air disappears in such cases, by absorption or otherwise.

BERIBERI.

Beriberi, or berbiers, is a disease of Malabar, Ceylon, and the East, and thought to be an inflammatory affection of the pleura and pericardium, attended with dyspnœa and œdema, and caused, it is believed, by vicissitudes of weather. There is also paralysis or numbness in the arms and legs, and the name of the disease, according to Good and others, is an oriental allusion to the tottering gait. There is also tremor and weakness of the voice. The disease appears to have been carefully observed, but there remains an obscurity respecting its true characters. It does not often affect women or children, but principally males of irregular habits.*

DISEASES OF THE NERVOUS SYSTEM.—Neurotica.

APOPLEXY.

In apoplexy we have, commonly, sudden extinction of the mental powers, thought and consciousness, with sensation, and voluntary control over the limbs. Respiration and digestion are only affected to a certain extent, that is, so far as their movements are effected by the medium of the cerebro-spinal system. Hence the stertor in breathing, which itself probably could not go on long without danger to life; also the loss of the power of swallowing. The proximate cause consists in various states of disease of the brain, most commonly derangements of its circulation, from plethoric excitement, distended stomach, or affections of the heart and lungs. The derangement itself may be merely turgescence, or hæmorrhage, or serous effusion. Both the large and the small cerebral vessels are often to be found diseased in structure, as also in cases of pulmonary apoplexy. In other cases there may be tumour or *ramollissement*† as the cause of apoplexy and of the rupture of the vessel. Individuals affected with acne rosacea of the face are fre-

* See several accounts of the disease by Hamilton, Christian, and Ridley, in Johnson's "Tropical Diseases."

† Either white, atrophic—or red, inflammatory.—Todd.

quently attacked with apoplexy or paralysis. The effusion of blood causing the disease is sometimes confined to the superficies of the brain.

As a rule, apoplexy, coma, and paralysis, are probably more generally the results of perfect destruction of the cerebral structure, or of pressure from various causes, as venous fulness, than the convulsive diseases, such as epilepsy, the causes of which will often be determination of arterial blood, irritation, intrinsic or distant, and inflammation. Convulsions, however, occur in cerebral effusions.

Of course the treatment of this important disease must vary according to the supposed cause. Whilst it would be fatuitous to spare the lancet in the case of impending apoplexy, or of fulness of blood in the encephalon, it would be of less avail in the case of a clot already formed, though even then often indispensable, to a less extent. The chance of perfect recovery in this latter case is principally by the clot being gradually absorbed by other means, but chiefly no doubt by the power of the vessels. In the case of softening from the natural degeneracy of old age, depletion to any extent would be worse than useless. The exciting cause of derangement in the circulation must be obviated if possible, the stomach and bowels often require unloading, and the latter, as well as the bladder and sphincters, being frequently semi-paralysed, entail the attention of the medical attendant.

PARALYSIS.

When a clot has been formed in apoplexy, or in case of a tumour, abscess, or partial softening of the brain, a loss of power in one or both limbs on the opposite side of the body is perceived. In this case both sensation and motion are generally, but not always, affected. The same side of the face is also often paralysed, though in a variable degree.* Such is a common case of hemiphlegia; in paraphlegia, on the contrary, the lower half of the body is affected, a state of things com-

* The fifth and ninth nerves are commonly, the third and sixth occasionally, the seventh and other respiratory nerves rarely, affected.—Todd.

monly the result of disease or injury of the spine, but sometimes arising from other causes, as cerebral disease or the effects of mercury, according to Dr. Bright. Commonly, in paralysis, the affected parts hang quite senseless and motionless, but often there is constant contraction of the muscles, and pain, and some have thought those contractions most common in cases of *ramollissement.** As use returns to paralyzed parts it requires a great mental effort sometimes, as Dr. Holland observes, to produce a movement. In paraphlegia the bladder commonly eventually becomes diseased, and sloughs and bed sores add to the danger of the case. Local paralysis, from injury of nerves, sometimes produces curious results in a limb, such as distortion, and even caries and absorption of some of the smaller terminal bones; fractures or ulcers, however, frequently get well in such cases.†

Our treatment in paralysis rests principally in the general management of the patient's health—in some cases perhaps endeavouring to promote absorption by the appropriate remedies—or if we suspect slow inflammatory action, moderating determination of blood by cold applications, counter-irritation, and so on—generally exercise of the affected parts, often tonics or stimulants.

PARALYSIS AGITANS.

In shaking palsy we have a curious involuntary and spasmodic action of the commonly voluntary muscles, the effect of disease in the brain or spinal cord. In one variety the chin is approximated by jerks towards the corresponding shoulder, in another the occiput is pulled backwards directly towards the shoulder; the arms are frequently affected.

* Rather due to irritation.—Todd.

† It appears most reasonable to believe that even in the limbs the nutritive vessels receive their power from ganglionic nerves united with the spinal nerves; but speaking of such cases, Mr. Paget observes, "It is difficult to say whether the influence on nutrition is exercised through sensitive nerve fibres of the cerebro-spinal system, or through sympathetic ganglionic nerve-fibres; and I think it is probable that it may be exercised through both."—Lect. vol. i.

CHOREA.

In chorea we have a more irregular and less continued form of a similar disease, occurring however, in most cases, without any organic mischief, and therefore very amenable to treatment; the muscles of the limbs, face, and tongue, are all affected. It is generally seen in females, and at that age when their cerebral and spinal system appears to be at its maximum of irritability, that is, before puberty. When their physical and organic functions are established the disease ceases. The spasms are much diminished during sleep in chorea, as in paralysis agitans. In bad cases the brain or spinal cord has been found to be visibly affected, and not rarely other organs, the heart, stomach, or uterus. In some cases also the mind becomes somewhat weakened.

Tonics, mineral and vegetable, prove the most powerful remedies in chorea—in some violent cases probably soothing measures, such as methodic frictions or mesmeric "passes," music, the warm bath, or sedatives, may be useful in subduing spasm or producing rest; the cold, and shower-bath, with a variety of other remedies, particularly purgatives, have been found efficacious.

EPILEPSY.

Epilepsy is one of the most curious and important diseases of the nervous system, so curious, indeed, that it has often excited the superstition of mankind. Hippocrates wrote a book to prove that it was no *morbus sacer*, but arising from common causes. The three principal features of the paroxysms appear to be—spasmodic contractions of the muscular system, often felt by the patient at the commencement of the fit, but not under his control; interference with respiration from the spasms seizing the muscles of the chest, neck, and larynx; and loss of consciousness. The semi-apoplexy would necessarily arise from the effect on the respiration, and also secondarily on the circulation in the neck according to Dr. M. Hall, but probably principally from the former. The interrupted and urgent cries when

the patient is first taken, appear to be more from the convulsed state of respiration than from fear or pain, though they often give the idea of these to the bystander. The jaw has been dislocated by the force of the convulsions, and in three cases in our experience the shoulder. The strong respiratory effects cause a bloody froth to appear at the lips, the blood sometimes, however, coming from the bitten tongue. The breathing, at one time quite or nearly stopped, soon returns in violent gasps of inspiration and expiration ; the convulsions, which were at first rather constant contractions, become interrupted, and then merely occasional twitches, as is well seen in the face, the sopor and coma more or less prolonged remaining, and so ends the attack, in some cases, however, soon to be repeated, for several or even many times. Epileptics have often been noticed to be somnambulists. A species of forgetful vertigo affects others. The proximate cause of the disease often appears to be some irritation at the origin of the sensitive or motor nerves, probably of very various nature. But as chorea and hysteria have commonly no origin of an organic nature in the nervous centres, so occasionally probably, it is the same with epilepsy. According to Dr. Bright the cineritious matter of the brain is sometimes found too vascular, the skull often unduly thick, and not rarely the pituitary gland abnormal. According to the Wenzels the latter body, the pineal gland, and the sphenoid bone, are often affected with disease. Tubercles, tumours, *ramollissement*, exostosis, *spicula* of bone, inflammation, turgescence, or effusion, are all occasionally found in the cranium after death, and have acted as causes of the disease. Also actions producing determination of blood, as bodily exertion, speaking, rage, or coughing, or the action of chloroform. Irritation from diseases in distant parts is also a common cause of the disease ; such are teething, worms, menstruation, pregnancy, dyspepsia, surgical operations, or parturition. *Metastasis* is also another cause of the disease, and also some agents or circumstances acting through the senses, as odours and music ; also poisons and emotion. Epilepsy and convulsions also attend the outbreak of erup-

tions and the progress of hooping-cough. The disease is a common attendant upon insanity, and itself in many cases leads to fatuity. It might be considered impertinent to add any brief remarks upon the treatment of this serious malady, requiring so much attention and judgment in its care, and even then difficult to treat and particularly liable to recur. However, we may say that medicine and management can sometimes do much, often cure, or, if the cause is of a permanent nature, alleviate or diminish the number of attacks.

CATALEPSY.

This curious affection is more commonly seen as a phenomenon of Mesmerism than in medical practice, yet genuine cases of it are on record, more genuine, probably, than such as are witnessed at the *séances* of animal magnetism. The patient in such cases, during the paroxysms, is insensible, bodily and mentally: the respiration and circulation are unaffected, or sometimes oppressed, the muscles are in a strong state of contraction, retaining any position in which they are placed, forming the characteristic of the disease. The application of cold, disordered states of health, and mental emotion, particularly grief or fear, appear to have caused it. Ecstacy appears to be a religious catalepsy or trance, speech however remaining, but sometimes in an unintelligible form.

HYSTERIA.

In hysteria the nerves and corresponding muscles of respiration and emotion are most visibly affected, but also other muscles and organs. False sensations are often prevalent (during the paroxysm in the form of an internal movement or twisting, globus hystericus), the brain is less disturbed in its functions than in apoplexy, but there is some degree of unconsciousness. The whole cerebro-spinal and ganglionic nervous systems appear to be in a very susceptible state, either from debility, distant irritation, or mental causes. Hysteria often simulates the appearance of other affections, and seldom attacks individuals of a well regulated mind; it

is rare except in females, in whom too often the feelings are allowed to be unchecked by the force of the will or understanding.

TRISMUS AND TETANUS.

These complaints probably arise from the sympathy of the brain and spinal cord with the nerves implicated in some local injury, which was, it may be, little perceived when inflicted, or in a part little sensitive,* or which may have been neglected or roughly treated, the system adopting, as it were, these unfortunate modes of showing its perception of the injury. Sometimes a degree of vascularity in the brain and medulla, or their membranes, is found after death, and cases are given by Tweedie and Olivier where idiopathic inflammation of the cord or its membranes caused all the symptoms of the two complaints. Vicissitude of temperature, or mental disturbance, may cause the affection to come on in the wounded. Trismus or lock-jaw produces an extraordinary mortality in the infants in Iceland, as it formerly did at St. Kilda's. It is not uncommon in animals, and both it and tetanus, or rather the tendency to them, may exist in man in a slight degree and disappear. A fatal case of tetanus occurred to the author's knowledge after abortion. Tetanus has also arisen when the nervus vagus, or sympathetic, has been irritated by neighbouring disease. As in hydrophobia, the pharynx, œsophagus, and stomach, are often inflamed, probably secondarily. With respect to the two varieties of tetanus, in emprosthotonos, the flexors, in opisthotonos the extensors of the trunk are affected; but in some cases neither set is more affected than the other. The disease has evidently some analogy to hydrophobia. In tetanus the bowels are always torpid; there is great heat of skin, and pungent sweats, and a discharge of saliva. The spasms appear to affect all the muscles which are in any way

* Some have indeed supposed these diseases to be most apt to occur when the accident is attended with little pain, the latter being, as it has been well observed, the safeguard of the body.

under control. The heart is little deranged in its function, but becomes weaker, and, according to some, the effect upon it is the cause of death. The mind is little affected. Tetanus, as well as hydrophobia, at present forms one of the *opprobria* of our art. Dr. Symonds observes, "The tetanus produced artificially by the 'chatte' of Java has been removed or abated by the tecunas of North America;" and "it is incumbent on us to look out for new remedies, since the old ones have all failed."*

Mental Diseases.—Mentales of Cullen.

MANIA, INSANITY.

These diseases appear to require peculiar and high powers of mind for their investigation, and constitute one of the most interesting of researches for the physician as well as the psychologist. It is evident, in the first place, that morbid lesions of the nervous centre produce symptoms but little different from what is called mental alienation. It is certain that idiocy, for instance, is commonly caused by a want of development in the brain. This fact we also see in the delirium produced by meningitis, as it occurs from an accident, or fever, or from the effect of alcohol or opium, and in the degree of fatuity which is so often seen after fevers, epilepsies, in old age, or after injuries of the head. The frequent occurrence of mania also as a sequela of diseases of the brain, and *vice versâ*, the frequent termination of mental disease in apoplexy or paralysis, show the same thing. Both classes of affections, too, may be caused by certain corporeal diseases or causes of irritation in the viscera, distant from the brain, as well as by metastasis.† These latter facts at least show that in such cases the com-

* Cyc. Pract. Med.

† Insanity may also be suddenly cured by a new disease arising. A patient, who was before a confirmed lunatic, became suddenly and perfectly sane upon the rapid irruption of disease in the elbow joint. So connected is insanity, sometimes, with internal disease of the digestive or other organs that Bichat located some of the moral feelings and

plaint has probably a corporeal origin. A poor or depraved state of the circulating fluid may produce a degree of fatuity, as we see in bad cases of scorbutus or starvation. In the very young, and in the aged, we sometimes see very slight causes of bodily disturbance easily interfere with the mental functions, and such disturbances in them are less serious than the same in middle age. The testimony, too, of many of the most eminent men in this department—Greding, Haslam, Georget, and Foville—appears to prove the fact that insanity is generally caused by, or at least attended with, disease of the brain, and that confirmed insanity at any rate may be considered as rather a bodily than a mental disease. And though sometimes no lesion at all has been detected in the brain in bad cases of insanity, yet it must be borne in mind that great experience in this part of morbid anatomy may be required to decide on this point, nor can the scalpel always be expected to detect lesion of nervous matter, particularly if it depends solely upon simple determination of blood, or inflammation. Delirium tremens, or even intoxication, are forms of violent but temporary insanity, and no doubt the brain is correspondingly affected, yet in such cases the only morbid appearance may be some slight vascular turgescence or even none at all.

The above shows evidently a plain sequence of cause and effect in cerebral lesion and insanity, but it does not prove that in some cases the mind is not primarily disordered, and acts on the brain, evidencing the action of the spiritual on the corporeal, as the former phenomena did of the corporeal on the spiritual ; nor does it prove that in some cases the disease may not essentially be seated throughout in the mind, in its intellectual and moral endowments ; a mysterious, and in some respects a very serious subject, which we cannot help approaching with trepidation. But we may admit that insanity generally depends upon cerebral lesion, and also, at the same time, be allowed to doubt whether

passions, as well as some forms of insanity in the viscera, and their ganglionic system.

even the highest faculties of the mind are, as Dr. Prichard affirms, uninfluenced by cerebral disease, and yet be very far from a system of materialism. Dr. P. observes, "On the whole it appears to me that the existence of a separate, sentient, percipient, cogitative principle, distinct from the nervous system, but, by the constitution of things, capable at present of coming into relations with the external world only through the instrumentality of the nervous system, is a thing so certain and indisputable, that whatever affections of mind do not appear to be subject to changes from the various states and conditions of the nervous fabric or its parts, may safely be concluded to be affections of the immaterial principle itself." Whether we admit or deny the truth of the sentiments conveyed in this quotation, we may observe that we know the perfect distinctness of mind and matter, as a primary principle, from our own consciousness and internal feeling, also from revelation, and from what we observe in the universe around, where neither mind, nor even vitality, springs from matter, but from totally different causes.

And if we speak of the brain being the organ of the mind, it is so, in a very different sense from what the liver or heart is, with respect to their functions. They are the mechanical engines by which the functions are produced; the brain is simply a medium of action, through which the heaven-born principle, the mind, influences and is influenced. The principal parts of the brain, with the exception of the convolutions, appear evidently concerned in sensation and locomotion, as the corpora striata, thalami, and cerebellum, or are of the nature of commissures or tracts. There then only remain the convolutions as the organ of the mind, an ample expansion certainly of very vascular cerebral matter, covered by an equally vascular membrane, and enveloping the more internal medullary fibres, which apparently convey to and take away impressions from the convolutions. But what in those convolutions do we see to produce the phenomena of mind? Though some have observed some resem-

blance, as they think, in the meandering of the convolutions to the associations of mental impressions, yet it would be generally thought absurd to endeavour to trace any such relations. We may without extravagance suppose these convolutions to be a highly irritable and vascular substance, organized for spiritual impressions, but it requires a greater stretch of belief to suppose that they generate mental phenomena. In the opinion of those who have best written on the subject, the above connexions of mind and matter, "though they show us indeed, in a very striking manner, the mind holding intercourse with the external world through the medium of the brain and nervous system," yet, on an extended view, "they warrant nothing in any degree analogous to those partial deductions which form the basis of materialism." The brain may in some cases be injured to an extraordinary extent without the mental faculties being affected to any sensible degree. Indeed it has been observed, that the powers of the mind which are most peculiarly affected in insanity are those which are least dependent on the brain, or at least those which we can with most difficulty localize, as reason and conscience, though this is contrary to Locke's supposition. There are some mental phenomena which appear to show the independence of the memory and higher intellectual faculties; such a circumstance we see in double consciousness, and in those cases when objects of memory, long apparently erased, recur to the mind in different circumstances. Insane patients have often been observed to regain their faculties before dissolution.

Principles of belief which appear almost instinctive in us may be denied or not understood in insanity. Some have believed themselves to be no longer in existence, or have doubted their personal identity,* or think their bodies are animated by some foreign spirit, good or bad. It is doubtful whether such phenomena are best attributable to cerebral disease,

* This sometimes takes place in the dreaming during natural sleep, or after the exhibition of chloroform.

and therefore, though insanity appears to be commonly connected with bodily lesion, and though hereditary conformation may consequently lead to it, yet, in analogy with what is an ascertained law in other organs, in which disordered function, mental impulse, peculiar innervation, or even original temperament, of the vital force, if we may, like Dr. Prichard, admit such a term, may lead to evident disease of the organs, it is more probable that in some cases the origin of the disease is not to be looked for in the encephalon.

To define insanity correctly implies a real knowledge of the nature of the disease, and of the particular functions which are deranged in it, and has tested the powers of the wisest heads. Cullen defines vesaniæ, "the judgment impaired without pyrexia or coma;" and separates them into: 1. Amentia, "imbecility of the judgment, by which the relations of things are either not perceived or not remembered," and this either congenital, senile, or induced in men of sound judgment by evident causes (fever, diseased brain, poisons, &c.). 2. Melancholia, "partial insanity without dyspepsia," its varieties attended with false perceptions of health, state of affairs, extravagant passions, as love or fear, aversion to the ordinary affairs of life, inquietude and impatience, weariness of life, &c. 3. Mania, "universal insanity," *mentalis*, arising from affections of the mind—*corporea*, from evident bodily derangement—*obscura*, preceded by no passion of the mind or evident bodily derangement. But much of this is open to dispute—part certainly erroneous. Dr. Prichard seems to maintain that there is not commonly that error in the judgment or reason which is often supposed, but as Locke maintains, that maniacs reason correctly from false premises, taking their reveries and imaginations for realities; but can these false impressions obtain ingress into the mind without a default of judgment? No doubt, as Abercrombie has shown, madness in some cases is evinced in reasoning incorrectly from sound perceptions and premises, though indeed they are often affected.

The perceptions of real external objects are probably not often faulty in insanity, but are sometimes perverted by other hallucinations, commonly having regard to events gone by. Except in acute delirium false simple sensations and perceptions do not commonly cause the erroneous conclusions of insanity.

It has been observed by Drs. Abercrombie, Holland, and others, that to obtain some idea of the nature of insanity, the best plan is to compare it with some other somewhat similar phenomena, as dreaming or somnambulism, and also with certain hallucinations and morosities, peculiar opinions and feelings, strange but not sufficient to constitute insanity, as long as they are kept under control. "No principle or practice," according to Dr. Holland, "in mental disorders, can probably be successful, which does not recognize their relations to the phenomena of mind in its healthy state." Such phenomena are dreams, intoxication, trance, ecstacy, reverie, somnambulism, delirium, magnetic sleep, the passions, &c.

Beginning with the sensations or perceptions—some spectra or false images of sense are partly produced by real objects, others by spontaneous states of the organ, of the eye for instance, or it may be, more deeply, of the brain, but exaggerated by the imagination ; others occur to the eye, or ear, or touch, without any such causes, even in daylight, and have been supposed to be the result of momentary dreams.* The individual may not believe in the real existence of such

* A female, before and after puerperal convulsions, complained for some time that faces and other objects around her appeared of an extraordinary size. Impressions which have been habitually made upon our senses, the sight, the ear, or the touch, are also apt to return to us.

Our perceptions do not always exactly correspond with our sensations as is remarkably the case with the eye. For instance, if we see in the stereoscope two objects, one of which is blue and the other yellow, the perception is green. When one or both legs have been amputated the toes are still felt, and if a nerve is injured in its course or at its root, the pain is felt at its extremities. The images of vision are in reality on the retina, but we refer them to their proper distance.

spectra, though he may not be able to dispel them, and in this case no one would suppose him to be of unsound mind; but in delirium they are believed in as real objects, and especially in delirium tremens. Individuals indeed, who are probably sane, have believed in such *spectra*. In some corporeal disorder they have fancied perhaps that they have seen a spirit or angel, and if they have supposed such an apparition destined to work them some good, and have shown some good cause or ground why it should appear, it would be difficult to prove their unreasonableness, although we might be perfectly incredulous ourselves.

Sleep is a phenomenon, natural but curious, probably attended by some peculiarity in the circulation of the brain, the rest of the nervous system answering to that of the other organs. In dreamless sleep (if there be such) the mental functions, perception, consciousness, judgment, will, and the moral feelings, as well as the sensations and animal movements, are all extinct. Such perfect sleep is more the semblance of death than of insanity, but it is doubtful whether such sleep, "le sommeil général—l'ensemble des sommeils particuliers," ever exists, for, when we think we have enjoyed it, we may have given evidence of dreaming, though we forgot our dream, as is the case with the somniloquist. In dreaming, as in insanity, thoughts and feelings shaded by the state of the body or mind, long gone events, or late transactions, rise up uncontrolled by the reason, conscience, or will, or it may be more or less influenced by them. But in insanity the individual acts upon these false impressions, and though his sensations are awake they do not correct them; in waking from a dream, they are immediately at an end.

In somnambulism, a phenomenon in some respects between dreaming and insanity, the sensations are only partially asleep, the voluntary motion remaining active. But still the sensations do not correct the erroneous mental impressions, and it is doubtful whether they are attended to at all; a state of things probably similar to what we see in

some cases of monomania. In catalepsy, to the state of perfect insensibility is added that of muscular rigidity, a state of the system which may not have been observed in mania or dementia, but epileptic vertigo presents the characters of amentia, as the whole powers of the mind are sometimes for a short time suspended, and reverie appears to differ from insanity, to which indeed it often leads, principally by the present disbelief of the individual in the reality of his lucubrations; but reverie must be of different kinds: that of Sir I. Newton must have been intense concentrativeness, and the tracing of sequences of cause and effect, and of general laws, the external senses, at least perception, being sealed; that of the poet or novelist a wandering play of the imagination; the reverie of others mere mental inanity.

The faculty of attention is necessary for our sensations to convey perceptions to the mind, but in the ill regulated mind, as in certain cases of incomplete epilepsy, or of insanity, this faculty is not exerted, and vacuity of mind and memory is the result;* on the contrary, too concentrated an attention to one impression renders us insensible to others, and wonderfully enough, in certain morbid states, causes us to take our reminiscences or imaginations for realities. If some of the phenomena presented us by the mesmerist are real, which, however, we may reasonably doubt, they appear reducible to these principles. In reverie, dreaming, and insanity, memory, association, and imagination, are commonly predominant, often to an extraordinary extent, unchecked by the immediate operation of the senses, or of reason, so that forgotten scenes may reappear, and former impressions be taken for realities, causing fancied apparitions in some cases; in other morbid states the same faculties may be as remarkably weakened. In imperfect sleep or reverie we may sometimes, by an effort, trace our associations, but often it is out of our power. In

* We see this faculty of attention weakened to some extent in various diseases, in debility, fever, old age, or intemperance.

insanity there is sometimes great brilliancy of imagination and rapidity of conception, producing that acute appearance of the countenance and quickness of repartee in the conversation, so remarkable in lunatics. In amentia memory is often remarkably diminished, as it may be in fever, under the action of narcotics or anæsthetics, and in injuries of the head. In similar diseases, in coma, or in fainting, all impressions from sensation or memory may be lost, or only to a certain extent; certain habitual or automatic actions may be performed, or the loss of memory may only apply to names, languages, or particular events, subjects, or periods of time. It has been observed that language, numbers, and time, appear often to be tests by which mental imperfection may be ascertained. Reason or judgment, that high prerogative of man, by which he judges of the relations of objects, corrects the impressions of the imagination and feelings, and investigates truth, may itself be overbalanced and destroyed by the predominance and malregulation of other faculties, as well as from cerebral disease; the former we see in the various forms of monomania and moral insanity. How careful ought we to be in preserving the proper balance of our minds and hearts.

With respect to these derangements of the moral feelings, or what is called moral insanity, we apparently see such cases commencing at first in the exaggeration or perversion of the feelings themselves, without any reason to suppose alteration of the cerebral structure. Few individuals have their minds so equally balanced in regard to their faculties as not to show, occasionally, remarkable peculiarities. Old people are said to be particularly liable to these perversions of temper and feeling. In some persons these are so strong that unless they are kept under the constant control of the conscience and will, one feeling or passion may become all predominant. All counteracting affections may be overcome, and reason, judgment, and will, and even conscience itself, be dethroned. The brain becomes secondarily affected, and according to Pinel, in some of these cases the

passions only, and not at all the intellectual powers, are affected. The phrenologists tell us that in moral insanity the particular feelings are but the functions of different cerebral convolutions, and that the latter are in the first place excited. No doubt every temperament must have a corresponding cerebral organization for its manifestation, but the body is rather organized for the spirit, the brain for the mind, than *vice versâ*, and we should suppose the way to prevent such dreadful aberrations is to cultivate the other powers of the intellect, and feelings of the heart, above all religious impressions and the sense of moral obligations. These moral perversions, then, at length seem to derange the intellectual faculties, and cause disease in the brain itself, but the difficulty is how and at what point they accomplish the former. Does insanity take place before cerebral alteration to some extent happens, and is the intellectual perversion the test of the insanity, or may it exist without such purely rational derangement? A feeling of fear, grief, suspicion, diffidence, resentment, or considerations of health, may be so dwelt on, that at a certain point, perhaps, the brain becomes correspondingly affected, and hallucination is the result, becoming one form of monomania. Thus the religious person often dwells on the gloom of the future, without embracing the hope set before him, and at length becomes maniacal. On all other subjects the person may reason correctly.

The constitution and temperament of our minds, as observed before, vary infinitely, and like our bodies require discipline and control, all persons having some degree of peculiarity or eccentricity, no doubt a common cause of the disease. Common sense was well defined by Spurzheim to be the balance of power between the different faculties, and it is a serious fact that though we may cultivate our good feelings and tastes, as well as our intellect, to a high degree, yet we have other feelings and faculties in our nature, both of the heart and head, which require the constant control of religion, conscience, and reason. If the voice of these is constantly

attended to, the mind, at least as long as the body continues in health, will maintain its balance, notwithstanding any natural or hereditary peculiarity or tendency, or predisposing temperament, but if they be disregarded, if the wantonness of imagination or passion be allowed to assume unlimited sway, then the controlling faculties themselves become extinct or even perverted, and eventually the strange phenomena witnessed in mental diseases appear, the unequal spiritual excitement also producing inflammation or lesion of the encephalon itself, the organ of its manifestation.

In mania, in distinction to monomania or melancholia, in which the mind dwells particularly on one erroneous impression, the whole of the intellectual faculties are disordered and the nature of the disease is visible enough in the appearance and conversation of the patient. Such a terrible calamity may occur suddenly; it may be the result of intoxication, passion, or mental trouble. There is an absence of sleep, as in delirium tremens, and often considerable insensibility of body; the brain is evidently sometimes in a state of inflammation. The complaint shews itself in varied forms, frantic ravings, gloomy despair, or at last in confirmed dementia.

The latter term is applied by Pinel to what Dr. Prichard has called incoherent madness, characterized by rapid succession of insulated ideas and emotions, repeated acts of extravagance, forgetfulness of every previous state, diminished sensibility to external impressions, abolition of the faculty of judgment, perpetual activity. The English term, distracted, expresses this form of the disease.

Dementia and fatuity, the latter called also amentia, are the last stages of insanity, the first according to M. Georget, "a forgetfulness of the past, with a total indifference as to the present and the future," the insensibility of mind and heart which has followed the excitement of both; the latter the total absence or disregard of even the simplest sensations, ideas, or feelings; perception, volition, comparison, memory, judgment, all annihilated. The first state has been

occasionally recovered from, the latter is hopeless, though such patients may have comparatively lucid intervals. In senile dementia the memory of long past events often remains, though the present is not remembered or regarded. In some cases of imbecility or idiocy the mind seems to have stopped in its development at the phase of childhood, evincing all the characters peculiar to that age—fondness for dolls, trinkets, and trifles.

The treatment of insanity embraces an infinity of considerations, and requires much psychological knowledge, as well as practical tact. It may well be divided into medical and moral. It is conducted on two principles chiefly, that of the disease being one of the cerebral organ particularly, and that of its being produced by irregular actions of, and impressions on, the intellectual and moral functions themselves.* Very active treatment has been devised by some, as by the celebrated Rush, to combat the cerebral disorder, but it is certain that such plans have not that success which might be expected. Amongst moral remedies, light employment, and separation from old associations, may be well supposed to be most important means. Without going into such particulars, we may observe that the recoveries in this disease amount, in round numbers, to from about one-third to one-half of those affected—a greater proportion in puerperal insanity, an extremely curious form of the disease, showing the influence upon each other of heightened feelings and bodily debility.

* In 1431 fatal cases, 568 died of paralysis, epilepsy, apoplexy, convulsions, or cerebral disease. Sir A. Morrison.

CHAPTER VI.

On medicinal agents, their classification and action.

We can scarcely doubt, upon consideration of the subject, that medicaments are agents furnished by Providence for the relief of our sufferings: extensive enough in their powers, and easily enough procured, to justify this view. At any rate, the indigenous plants and productions of our own island would form a pretty complete materia medica. Some writers have essayed to prove that each country has native remedies enough to cure its prevalent diseases, and they give some remarkable instances of remedies, found in the particular localities where the diseases, for which they

are the cure, abound, as, for instance, the Cochleariæ, or scurvy-grasses, in those countries whose inhabitants are sufferers from scorbutus, as Denmark, Friesland, and Holland. The Rumex hydrolapathum, or herba Britannica of Pliny, the root of which was considered infallible in the same disease, has been instanced as a similar example, as also the tonic Menyanthes, or marsh trefoil, growing in the spots where fevers and ague abound. Others have maintained the opposite doctrine, that diseases exist in one hemisphere which can only be cured by remedies from the other, and instance the cinchona as a case in point. We see no necessity to uphold the first opinion, but at the same time should consider the last a questionable fact, not true certainly with respect to the bark and ague, as that disease may be well cured by other remedies; but if it indeed be the case, it only proves what we well know, that nations are not intended to be isolated, but cosmopolite, and to mingle and trade with each other.

How are the powers of medicine first ascertained? The sensible properties of some, their strong odour and taste, would lead to their being tried by the sick. But many have risen into note on imaginary or astrological grounds, being, it was supposed, under the rule of a particular planet, or of an imagined hot or cold, dry or moist, nature; the writings of old herbalists are full of such nonsense; and a noted doctrine of the same rank was, that the virtues of a plant may be discovered by some signature or mark possessed by it, reminding us of the organ or disease which it cures. Vervain, eyebright, burdock, celandine, barberry, saffron, cotyledon, and elm-bark, probably rose into note on such principles as the above.

It might be thought easy to ascertain the real properties of a medicinal substance, but the fact is otherwise, particularly if its action on the economy is of a slow nature. The degree of evidence which we have of the powers of a medicine may vary much, from a slight degree of probability to absolute certainty. Thus, a plant may have no very de-

cided external properties, but its virtues may have been credited for ages by the vulgar, or even by some medical observers, the legitimate judges, as in the case of the cardamine flower, or of mistletoe, as specifics for epilepsy. Neither appear to have any real power in the disease.* There are other plants, also, which have been the favourites of eminent physicians, respecting which we may entertain as strong doubts ; we would rank here Cullen's coltsfoot, and the dulcamara of Bateman.† The virtues of other remedies of this class, that is with scarcely recognizable sensible or chemical properties, may be allowed by most medical observers, and in this case it would be too bold to say such medicines have no real properties, and unwise not to use them ; but it would show too much deference to authority to be quite certain of their power. Such, perhaps, are dandelion and sarsaparilla : the latter, if a dubious remedy, is a costly one, as more than 100,000lbs. are annually imported. It appears to afford a sort of *pabulum* for morbid poisons to exhaust themselves on, and perhaps diet-drinks from other vegetables might answer as well, as the other species of Smilax, elm-bark, or sassafras. The latter grows a large and fine tree at Kew. Dr. Pearson's evidence is strong against the antisyphilitic powers of mezereon, for which, however, Daphne laureola is often substituted.‡ The Inula enjoys a popular reputation in depraved states of the blood.

* That rare British plant the masterwort or Imperatoria, appears formerly to have enjoyed a similar reputation; we have found it several times in the midland moorlands of England, but always near the site of some ancient homestead or cottage, and generally accompanied by the fragrant Myrrhis odorata.

† The Peltidea canina was strongly recommended by Dr. Mead as a remedy for hydrophobia, in combination indeed with pepper, Fernroot is a very old remedy for tapeworm, and again come into use, but to us it appears less efficacious than kousso. The rhizoma of Asp. dilatatum and that of the male fern, appear similar; the female fern is somewhat different. We find spiral and punctuated vessels in these plants, and stomata on the under surface of the fronds.

‡ It is grown for that purpose in Derbyshire.

There is reason to believe that even our indigenous plants have been imperfectly investigated. There are certain plants now neglected by the profession, which have always obtained a place in popular estimation, such as yarrow and horehound, which may possibly have some of the virtues attributed to them. Wormwood, tansy, and feverfew, have probably strong anthelmintic, tonic, and febrifuge powers. Centaury, Chlora, and Geum urbanum, are good bitters; Calamus aromaticus, and the root of the rarer Cyperus longus, are aromatics. Euonymus and Rhamnus, with infusions of mustard, horseradish, or chamomile, are emetics of various kinds. Bryony, mountain-flax, and Convolvulus soldanella, seem the best of our native purges, several having, also, strong emetic properties. The elder-bark, the daffodil, recommended in hooping-cough, the Ledum, Cicuta, Helleborus, Asarum, and the yew, with many fungi, appear to possess strong powers for good or evil.* We have numerous plants, as the extremely acrid arum, the ranunculus, or the mezereon, which might take the place of more costly blisters and rubefacients. Also astringents without end, several of them being popular and efficacious remedies for thrush, salivation, and diseased gums, as the astringent Terminalia chebula is with the Hindoos.

Agents whose virtues are universally credited, and have been so for ages, and that by the proper judges, no doubt possess the virtues attributed to them. There are some plants also, together with almost all minerals and salts, which have evident and strong properties, and these all appear worthy of attention, and medicinal. It is rational to conclude that no plant or substance has been created of unmixed bad properties, and, in fact, some of our strongest poisons have furnished our best medicines. What more

* The leaves of asarum, finely powdered, are a good errhine, its root has a spicy odour, somewhat like that of valerian. In doses of twenty grains the seeds of the darnel (Lolium temulentum) produced no effect; the rye-ergot, in male subjects, produces tormina. Polyporus Scoticus or laricis, has been used in phthisis.

virulent than arsenic* as a poison, yet who doubts its great curative power in proper doses? Nor can we doubt such medicines as rest on the plain evidence of our senses, such as foxglove and Atropa, and evacuants of different sorts. Other medicines have their powers corroborated by other considerations. We cannot doubt, any more than we can the principles of chemistry, the power of soda or magnesia to relieve a heartburn depending upon acidity, or of Tormentilla or oak-bark to constringe the small vessels.

The evidence for other medicines may be of a different and more complicated nature, yet equally strong. For instance, from time immemorial sea-bathing has been found to benefit scrofulous patients, and to disperse glandular enlargements, and poultices of sea-weed have been efficacious topical applications in the same cases. But burnt sponge also has been used by Mead, and others, in the same diseases, with good effect. In recent times a very curious and powerful chemical principle, or simple element, iodine, has been extracted from sea-water, algæ, and sponge, and all marine substances. This has been tried, and found to be one of our best remedies in scrofulous diseases; it has the confidence of a great majority of the practitioners of England and the Continent, and is found not only to disperse morbid enlargements, but if given too freely to diminish or dissipate natural parts or tissues, and cause the fat of the body to disappear in a very remarkable manner.

But foreign countries, particularly the tropics, afford us medicines of new, curious, or valuable properties. Many of the productions of the Levant, of South Europe, and of Arabia and Persia, were in use amongst the ancients. Dr. Royle has endeavoured to identify these productions, as known in different parts of the world, and in different ages —some of these are the fœtid gums, and myrrh; also elate-

* Introduced by Dr. Fowler, of Stafford, as a remedy for ague, periodical headache, &c., 1786. Dr. Fowler resided in the fine old timbered house near the market-place; we notice in St Mary's a stone with an affectionate inscription to the memory of his wife.

P 2

rium, colocynth, and scammony; castor-oil, senna, and rhubarb; galls, veratrum, stavesacre, squills, and gentian. The ancients of the West were acquainted with many of the productions of the East Indies, of China, and the Indian islands. These consist of gamboge, olibanum, benzoin, camphor, musk, cowitch, ginseng, and catechu, and their unequalled spices; Strychnos,* croton, cajuputi, cubebs, and cardamoms, are also oriental productions. Africa affords calumba, aloes, euphorbium, and bucku.† North America yields the powerful Rhus, Lobelia, stramonium, snake-root, Pyrola, Spigelia, sassafras, and serpentary: South America the valuable balsams, the bitter canella, cusparia, Simarouba, and Contrajerva, Jesuits'-bark,‡ tobacco, ipecacuanha, jalap, sarsaparilla, also Pareira, rhatany, and Angustura: the West Indies guaiacum, logwood, cascarilla, pimento, Cannabis, and quassia, the latter first sent by Rolander to Linnæus; guaiacum, as well as Spigelia, Pyrola, and snake-root, were estimated by the Indians. The Hindoos, also, knew many

* Strychnos, as a tonic, has long been used by the Tamool practitioners.—Ainslie.

† Bucku or buchu was much used by the Hottentots. Sparrman. There were numerous little known productions of the Cape in the Great Exhibition, as Hyenanche globosa, hyæna poison; Arctopus echinatus (antisyphilitic); Pharmacium lineare (sudorific and expectorant); also species of Cissampelos (emetic and cathartic); Pelargonium (used in parturition, dysentery, &c.); Melianthus (in ulcers and cutaneous affections); Cliffortia (expectorant); Stobæa (diuretic); and many others.

‡ The bark underwent a sort of canonization by Pope Innocent, *ex cathedrâ*, in 1661, but as it was to be given "frigore febrili incipiendo," the ceremony nearly upset its early reputation. Quinine has only been found in the cinchonas of the Andes, more precious even than the minerals within their veins. The Swietenia, Cedrela, Cornus, and horse-chestnut bark, have been recommended as substitutes for the cinchona. The first, according to Ainslie, is used by the Tamool practitioners in fevers, and contains a somewhat narcotic power. Cæsalpinia bonducella, or catcaranga nut, is also much used in the Bengal fever; it is very bitter, with no astringency, but other species of the genus have much astringency or acidity. Species of Portlandia, Bonplandia, and Melia, have some claims to rank with the cinchonas.

of our chemical remedies long before they were introduced into Europe—tincal, potass, nitre, natron, Glauber's-salt, magnesia, and oil-soap; sal-ammoniac, volatile alkali, and sulphur; the mineral acids; also stibium, orpiment from China, realgar from Burmah or Japan, kaundrum or magnetic iron ore, and verdigrise.

Basil Valentine introduced antimony and the mineral acids to us, and Paracelsus knew zinc, but it is to modern chemistry that we are indebted for a multitude of salts, acids, and other substances of the greatest value, such as chlorine, iodine, kreosote, cyanogen, and chloroform, as well as those beautiful vegetable principles the alkaloids.

Most of the metals, when unoxidized, have no power, not even arsenic, copper, or mercury—and the more oxidized they are the more powerful they become, and so with regard to the combination of metals with iodine or chlorine. There are no anodynes, nor bitters, nor perhaps purgatives, amongst metallic preparations, but the alkaline or earthy salts present numerous examples of the cathartic power. Most of the sulphates have such a property, but alum is an exception. Nitrates and muriates often pass into the blood, and cannot commonly be given in such large doses as the sulphates, they may pass out of the system by the skin or urine, and the latter is the case with vegetable salts, which are, however, decomposed. Nerve medicines are commonly either very volatile substances, as alcohol, ether, camphor, or chloroform, alkaloids sparingly generated in plants, as morphia, or metals highly oxidized.

Little of uniformity or system has been traced by De Candolle or Dierbach, in the medical powers of vegetables, in connexion with their botanical position, part of the plant medicinal, and so on. The umbelliferæ are often either aromatic or narcotic, very generally acrid; the leguminosæ are rarely poisonous, but often astringent or stimulant to various organs, generally nutritive; the ranunculaceæ are acrid; papaveraceæ narcotic; cruciferæ stimulant and anti-scorbutic; terebinthaceæ balsamic; cucurbitaceæ purgative.

But such uniformity by no means holds good in many cases. Neither do we understand those processes in the vegetable economy which cause the production of their medical virtues. Roots frequently contain mild nutrient principles, but sometimes they are of more decided properties; the woods and barks, particularly those of hot climates, often yield bitter principles. Narcotics are frequently produced by plants of humble growth: the seeds, pericarps, and calyces of many are aromatic, and the most costly of the spices are yielded by these parts of plants; leaves have generally much of the virtue of the vegetable.

An Index of Medical Effects, and of Medicines.

Medicaments act on—

A. The Nervous System (Neurotics), either directly applied, by sympathy, or after being absorbed from the alimentary canal, skin, or lungs.

a. Affecting the brain and its faculties.

1. Stimulants, exhilarants (primarily). Opium, codein, hemp, alcohol, tobacco, ether, ammonia; (agrypnics) tea, and often opium.
2. Sedatives (secondarily). Soporifics, hypnotics, narcotics. Morphia, belladonna, henbane, hemlock, tobacco, hemp, camphor, lettuce, cocculus, nutmeg.
3. Anæsthetics, anodynes. Many of the preceding groups; chloroform, vapour of ether.

b. Affecting the spinal cord and nerves.

4. Cinetics. Strychnine, brucia, Rhus, Cerbera; (partial) secale, rue, borax, electricity.
5. Sedatives. Aconitine, atropia, chloroform, camphor; group 3. Antispasmodics. Musk, castor, valerian,* iron, zinc, and copper; the warm bath.

* That fine and rare plant, the Valeriana pyrenaica, grows abundantly in one wood near the author's residence; its root has the virtues of V. officinalis in a strong degree, as has also that of V. dioica. Dr. Royle tells us that V. nardostachys or jatamansce is the nard and spikenard of

c. Affecting the ganglionic system?

6. Tonics. Bitters, some of them allied to preceding groups, as nux vomica and hop. Quinine, salicine,* bebeerine, chiretta, quassia, calumba, gentian, centaury, Menyanthes. (Stimulant and diaphoretic tonics) contrajerva, serpentaria; (emetic) simarouba; (aromatic) Wintera, canella, cusparia, cascarilla, costus, galangal, calamus; (metallica) arsenic, silver, copper, iron, zinc; phosphorus, acids, cold bath.
7. Sedatives. Hydrocyanic acid; (purgative) colchicum, veratria, delphinia, sabadilla; kreosote; groups 2 and 5.

B. The Digestive System (Cœliacs), either by contact or through the circulation; sometimes mechanically or chemically.

a. On the stomach, or stomach and bowels.

8. Emetics. Ipecacuanha, Gardenia,† senega, antimony; (irritant) camomile, mustard, horseradish, Asarum; copper and zinc; (narcotic) Lobelia, tobacco.
9. Carminatives. The spices, cardamoms, Hedychium, umbelliferæ, syngenesiæ.

b. On the bowels.

the ancients. Its odour much resembles the patchouly or putnee pat (Pogostemon patchouli). V. Hardwickii is used medicinally in Nepaul. V. montana is the Celtic or mountain nard, exported from Europe into the East as a perfume. The oriental name for the nard is Sumbal, but the musky plant of that name lately introduced into medicine by Dr. Granville, is said to be an umbelliferous plant of Trebizond and Persia.

* Salicine may be obtained without much trouble from the cold infusion of some of our willows. Salix pentandra, worthy from its handsome appearance and fragrant smell to be reckoned the bay or laurel of the hilly or subalpine districts of England, abounds with it; also S. fragilis, and S. Russelliana, the crack and Bedford willows, both often growing together in a district, the former being more spreading, and with a handsomer leaf, the latter attaining often to an enormous growth, as in the case of Dr. Johnson's willow at Lichfield. S. purpurea, helix, alba, and vitellina, have also a bitter bark, the sallows generally not so.

† Maru karung kai, dose, four scruples —Ainslie.

10. Purgatives. Aloes, rhubarb, senna, castor oil; (drastic) gamboge, colocynth, croton, and hellebore; (hydrogogue) elaterium, jalap, cream of tartar; (sedative) veratria, colchicum; (saline) sulphates, tartrates, phosphates; calomel.
11. Absorbents. Magnesia, chalk.
12. Demulcents.

c. On the liver.

13. Cholagogues. Calomel, mercury, muriate of ammonia, soap, taraxacum.

C. The Circulation (Hæmatics) acting on the vessels, or on the blood.

14. Blood medicines. Iron, vegetable juices, cruciferæ; acids, chlorine, alkalies; diluents, astringents, mercury, bleeding; purgatives and other evacuants.
15. Antifebriles, antiphlogistics. (Chemical) nitre, sulphate of soda, &c., acids. Cold.
16. Stimulants. Ammonia, hot bath. Group 1.
17. Sedatives. Antimony, foxglove, hyoscyamus, camphor. Group 2.

D. The Respiration.

18. Sedatives. Stramonium, chloroform, ether, opium, assafœtida.
19. Expectorants. Squills, Allium, ipecacuanha, antimony; turpentines and balsams; ammoniacum and "the gums;" senega, Dracontium, Sapindus emarginatus.

E. The Absorbent and Secreting system (Eccritics).

20. Stimulants. Mercury, iodine, bromine.
21. Deobstruents. The gums, iron; group 20; fish-oil, Pyrola (Dr. Paris).
22. Sialogogues. Pyrethrum, mercury, nitric acid.
23. Diaphoretics. Antimony, Dover's powder, the hot bath. Ammonia and sulphur; guaiacum.
24. Diuretics. Foxglove, squills, Genista, Alchemilla, juniper, horseradish; vegetable salts; turpentines,

Lytta, nitric ether. (Astringent) uva ursi; (astringent and aromatic) Pyrola; (tonic) Pareira; (tonic and aromatic) bucku.

F. The Capillaries and Tissues.

25. Astringents. (Vegetable) tannin and gallic acid, Terminalia, Cæsalpinia, Heuchera, matico, catechu, and kino; rhatany, galls, logwood, pomegranate: *pl. indigenæ,* as tormentil; turpentine, kreosote. (Mineral) lead, zinc, iron; acids.

G. 26. Emmenagogues. Iron, rue, senega, hellebore, savine, orache, Cæsalpinia sappa, the gums. Chalybeate waters.

H. 27. Epipastics and Counterirritants. Lytta and Mylabris, antimony, croton-oil, Plumbago, Pothos, arum, ranunculus, mezereon, acids, iodine.

I. Specifics, or having a *modus operandi* which is supposed to be antagonistic to different morbid agents, rather than on the different functions.

28. Antiseptics. Chlorine, nitric and hydrochloric acids, oxygen, carbon, iodine, ozone?

29. Antisyphilitics. Mercury, sulphuret of mercury, gold, antimony, iodine, nitric acid. Sarsa, China-root, guaiacum, sassafras, mezereon, Arctopus echinatus, Semecarpus anacardium, mudar (Asclepias gigantea), elm, Inula, Arctium.

30. Antiarthritics. Colchicum, aconite, cajuputi, arnica, Liriodendron, Xanthoxylon, azalea, guaiacum, and "the woods;" arsenic, hydriodate of potass, alkalies, narcotics, hot bath, tepid nitrogenous bath of Buxton.

31. Antiscrofulous medicines. Iron, iodine, bromine, alkalies, hemlock, sarsa, Asclepias, Semecarpus; groups 21 and 6. Sea-bathing.

32. Antileprous medicicines (antipsorics). Arsenic, sulphur, and sulphurets, sublimate of mercury, acetate of potass, Asclepias, Semecarpus, Sedum, elm, Œnanthe, Lytta, veratrine, stavesacre, petroleum, Chabert's oil, sulphureous waters.

33. Anthelmintics. Turpentine, sulphur, muriate of soda, tin, kousso, dolichos, Geoffræa, male-fern, stavesacre, Spigelia; bitters and cathartics.
34. Antilithics and lithontriptics. Pure water, alkalies, phosphates, acetates, tartrates, carbonates; lime, soap; borates, acids.
35. Antacids, &c.

We have above observed that the fact of medicinal power in a substance is more difficult to ascertain than might be expected, so various are the causes by which vital phenomena are disturbed. Such observations should be verified in different ways, also alluded to above. More difficult still is it to ascertain by what kind of force acknowledged medicines affect the economy, or their *modus operandi*, but this no doubt will become plainer as organic chemistry progresses. The above Table or Index is an arrangement of medicines only partially according to this plan, but rather according to the organs which they ultimately affect, the effects they produce, or the diseases they cure. But though the dynamic action of medicines upon vital tissues or functions is often obscure, the effects themselves are matters of observation, and capable of various proofs, and "it may suffice the physician to know the effects of a medicine when applied to the body, though he knows not the particular manner whereby it acts."* Many medicines may perhaps really act directly on the nerves with which they come in contact, and by means of them the effect is spread to a greater or less distance; this we see perhaps in the effect of atropia on the pupil of a single eye, or of aconitine† applied

* Van Swieten, as quoted in Headland's interesting essay.

† We obtained twenty-six grains of aconitine from half a pound of the A. ferox of India, used by some of the natives for poisoning their enemies or their horses; when administered to an animal aconitine is often rejected by vomiting; one quarter of a grain inserted under the skin destroyed a cat after ten minutes, producing paralysis, dilated pupils, and some convulsions. As an external application, though extremely diluted, its effects are violent and far from pleasant.

to the tongue or skin, or of snuff to the nares, though some think there is no action except by absorption even in these cases.* The curious experiments to prove that poisons invariably act through the circulation are perhaps not entirely conclusive, neither, if so, that the absorption is accomplished through the veins. It has been found that a poison when taken into the stomach of an animal, does not act if the vena porta is tied, but in the same experiment the cardiac orifice was tied, and both nerves and absorbents must have been included in the ligatures. No doubt in the generality of cases poisons and soluble medicines pass from the stomach, bowels, skin, or bronchial membrane, into the blood, and there is as little doubt, from the observations of Hering and Blake, that the velocity of the circulation of that fluid is quite sufficient to account for their rapid effects, even in cases of very quick poisoning.† Ferrocyanide of potassium has appeared in the urine almost instantaneously after its administration. But if all such experiments are quite unequivocal, they do not prove that poisons will not act at all without absorption—that prussic acid, or strychnine, or aconitine, would not kill without it, by action on the nerves.

A great variety of medicines and poisons have been discovered either in the blood or urine, as well as in the milk, saliva, and breath, and sometimes in the parenchyma of the viscera, the bones, or the skin, showing the universality of absorption. Thus have been detected various pigments, quinine, salts, metals, odours, alcohol, sulphur, iodine, turpentine, &c. Some of these are found to be decomposed,

* Valentin observes that we may behead a frog, excise its heart, and lay bare the spinal cord, and then the application of strychnine to the last will produce the usual effect.

† The opinion of Bernard with respect to the hepatic and renal circulation (no new idea, however), if correct, would lessen the proofs brought forward for the rapidity of absorption into the general circulation, by withdrawing all such experiments as are supposed to prove the same by the substance which is administered being detected in the urine.

oxidized, or variously combined; thus acids become salts, vegetable salts carbonates, sulphurets sulphates, benzoic acid, or oil of bitter almonds, hippuric acid. Some substances take one channel of evacuation, some another. It does not appear that many of the substances have at present been discovered in the thoracic duct, and if this hold good, they must certainly very generally enter the circulation by means of the veins, and often of course by the vena porta; but it may be more difficult to detect these substances in the chyle, as indeed is the case in the blood, than in the urine.

Medicines, when received into the blood, act in various ways, and for their operation on that fluid itself we may probably find a *rationale* in chemical facts. In scurvy, Dr. Garrod supposes potass to be deficient; we would rather suppose there is a superabundance of soda or its chloride. Many medicines appear to have no action at all on the blood, but only on the nervous system, through the blood, as in the case of opium. If we ascend higher, and inquire how this or any such medicine acts on the nervous substance and its functions, we fear we must confess our ignorance; Liebig says, because the chemical composition of the alkaloids and of the cerebral substance have much analogy, and he has in the same manner compared the medicinal bitter principles to the bitter taurine of the bile. Like the ordinary change in the state of the brain from activity to repose, nerve medicines have first a stimulant and then a narcotic effect. Tartar emetic appears to be absorbed before it acts as a vomit, as it operates when injected into the veins; but perhaps it is not certain that it would not act without absorption. White vitriol is rejected as soon as swallowed, and no doubt acts by immediate irritation, as many other emetics and purgatives do; this irritation may be chemical, or more difficult to account for, what we may term vital. The phenomenon of the passage of fluids of different density or nature through porous membranes, as first described by Dutrochet, en- and ex-osmosis, appears very similar to what occurs in the alimentary canal with regard to some medi-

cines, particularly saline purgatives. Thus strong solutions act as watery purgatives, producing a copious flux of serum from the blood into the bowels, whilst weak ones, on the contrary, are absorbed into the blood from the bowels to pass out afterwards by urine. Headland thinks that some resinous or acrid purgatives, as elaterium or colocynth pass into the blood, but he believes this to be the exception and not the rule. Antifebrile agents act in various ways, some by lowering the action of the heart, and also, consequently, producing relaxation of the pores and perspirations, such are bleeding and antimony; nitre and salines are believed to counteract the tendency to coagulation of the blood and fibrinous deposit, which they do out of the body; the calomel, purgatives, and diuretics, which we give in such cases, no doubt act by evacuating noxious matters, or by elimination. Some so-called specifics are probably also eliminatives, as iodine or mercury. The tendency of the present age seems to be to consider most diseases chemical in their nature, and most remedies also to have a chemical action.

CHAPTER VII.

The origin of disease—Analogy between it and moral evil—Overruled for our good by Providence in various ways—Necessity for the existence of pain—Curative and reparative power of nature.

THE origin of evil, disease, and pain in the world, which we must admit are but too prevalent, has always been a problem for the mind of man to solve, and has not unfrequently led to scepticism, or to doctrines which have a tendency to impugn the attributes, which we are taught to acknowledge, as existent in the Creator. This was the case with the Oriental Gnostics, about the Christian era, as well as with the later Manichees, who were led to believe in the

existence of a dualistic principle of good and evil, a *pleroma* and *demiurge*, in the government of the universe. The same leaven is seen in Sabeism and in the Ormuzd and Ahriman of Parseeism. According to the latter doctrines, the principle of evil and disorder is successfully combated by the good, whilst the Gnostics, with the Brahmins and Buddhists, do not look for any benign influence in the present state of things, the empire of evil being all predominate. *

We hope, as far as such considerations can be applied in the case of medicine, that we might rather embrace the former view, and believe that, both in the physical and moral world, it *is* possible for the good principle to wage a successful war against the evil,—or (in medicine particularly) for those curative means which Providence has furnished, aided by that restorative power of nature, that emanation of the rational soul of the world, the vital force, the φυσις of Hippocrates, the *archeus*, *vis medicatrix*, or *autocrateia* to combat successfully the inroads of disease.

We take as our text for this part of our subject the revealed doctrine of the origin of evil, disease, and pain, as we know of none equally satisfactory. We think that man is not in his pristine state, and we believe that if our world were now as it was when it came from the hand of the Creator, neither disease nor pain could exist in it. From the same reasoning we do not admit that, strictly speaking, they are the work of the Divine Being, but the result of primeval delinquency, or of our own follies and vices, accompanied with the neglect of those means of preserving health which Providence has placed in our hands : with Hippocrates we must argue against a *morbus sacer*. Though God often permits it, we do not agree with Dr. Duncan † in calling Him the direct author of sickness ; nor with a recent writer who calls consumption "one of the most destructive weapons of the Almighty," to which "the sword and the famine are comparatively insignificant." Can the writer see no exciting

* Neander, "Church History."

† "God in Disease."

cause for the disease in ill-assorted and too early marriages, pernicious modes of life, &c., without having recourse to such a view? Again, we read in Hecker's "Epidemics," by Babington:—"That Omnipotence which has called the world with all its living creatures into one animated being, especially reveals himself in the desolation of great pestilences." In our way of thinking, such views appertain rather to the worship of a Siva than to Christianity, though we admit that pestilences are overruled by, and are subservient to, the ends of Providence. Even now in healthy localities, and with temperate habits, probably the generality of mankind would live to old age free from disease and pain. Such patriarchs may be often seen in rural and primitive districts, generally affirming that they were never ill in their lives, thus almost nullifying the doctrine that man is naturally subject to disease and its attendant evils. But granting all this, and that sanatory regulations may wonderfully prolong the average of life, we must yet be moderate in such views. We do not say that disease is in every case the result of the infringement of the "organic laws" by ourselves or our immediate predecessors; there is no proof that it is. It may depend often upon an original or long standing imperfection in "the stuff we are made of" for aught we know. Let it not be said to every sick man, as Job's friends said to him, that his afflictions must necessarily be the effect of his own delinquencies and violation of physical laws. The man born blind in the Gospel had neither sinned himself nor his parents, but his disease was permitted that the power of God might be shown; so in other cases disease may be allowed for a beneficent object, and often, very often, we doubt not, to lead the worldly mind to think of the future, to teach the suffering spirit to place its hope upon providence, to touch the heart with a sense of thankfulness for mercy and restoration received, or to try the faith and patience of the established Christian. Seldom, as Dr. Duncan argues, is disease sent as a punishment, and never as a retaliation. And who can doubt that sickness, and pain, and death,

which so intimately concern his principal work—man, are under the constant control of the great Author of our being, though He is not the willing cause of them? We cannot believe that incurable and unrelievable disease and pain exist by the *fiat* of the Creator. If "the whole creation groaneth and travaileth in pain," yet "the creature was made subject to vanity, not willingly," but to be "delivered from the bondage of corruption." "Christ hath taken away the unhappiness of sickness, and the sting of death, and the dishonours of the grave, of dissolution and weakness, of decay and change, and hath turned them into acts of favour, into instances of comfort, into opportunities of virtue; Christ hath now knit them into rosaries and coronets; He hath put them into promises and rewards; He hath made them part of the portion of his elect; they are instruments, and earnests, and securities, and passages, to the greatest perfection of human nature and the Divine promises. So that it is possible for us now to be reconciled to sickness; it came in by sin, and therefore is cured when turned into virtue; and although it may have in it the uneasiness of labour, yet it will not be uneasy as sin, or the restlessness of a discomposed conscience. If, therefore, we can well manage our state of sickness, that we may not fall by pain as we usually do by pleasure, we need not fear, for no evil shall happen to us."*

Dr. Duncan admirably shows the economy of sickness. Whilst "the citadel is seldom taken until the close of a more or less protracted siege," yet the uncertainty of this, and the possibility of a more sudden death, is the best arrangement for the inculcation of a wary walk, rather than a certain death at a particular period, either by a sudden stroke or by a lingering disorder."

Mortality and death must also be considered as a necessary part of that wonderful arrangement, by which the peopling of the world, and the extension and limitation of population is regulated—a subject which obtained the

* Jeremy Taylor, "Holy Living and Dying."

attention of the celebrated Arbuthnot, of Hufeland, and Blane; but the admirable laws of which are only now being elicited. With respect to births, Blane argues, that if blind chance alone governed the proportion of male and female infants born, there would probably soon be a great disproportion in the sexes. Philosophy fails to explain this equalization to our satisfaction; one only reason can be given for the occurrence of all the facts relating to the prolific power or longevity, either in man or animals, and that is—design and final cause. This consideration renders perfectly credible (speaking philosophically) the accounts we have in Genesis of the longevity of the antediluvian race.

It is worthy of remark how animals are propagated on the earth, and are continued in suitable number, without being either eradicated or overrunning the face of nature. Length of life, liability to disease and other destructive agencies, number of progeny and of annual litters, length of gestation, age at which breeding commences, and duration of lactation, are some of the arrangements by which this proper proportion is brought about. Amongst quadrupeds the largest are commonly the longest lived, and like man, have not more than one or two at a birth; they go with young many months; they, at least the pachydermata, increase less than man, for though they may breed earlier, they are often restrained from it by him, and in a state of nature their size, and the consequent difficulty of obtaining food, has the same effect. The sow is exceptional to most of the other pachydermata in being exceedingly prolific. The ruminants breed earlier than the pachydermata, are numerous in species, short lived, and plentiful; they constitute the chief food of carnivorous animals. The rodents are small animals, very prolific, breeding at an early age, and short lived; they would soon overrun the earth were it not for the numerous predaceous animals of which they are the food. The carnivora appear to increase in proportion to the abundance of prey; they have numerous litters, but a moderate longevity and time of gestation; the lion is said

to attain the age of man, and has three or four cubs at a birth, but man is able, even in the savage state, to wage a successful war with him. There appears to be no general rule which holds good in these cases. What is called final cause, or, in other words, original designs to answer a good end seems the presiding principle, and the physiological particulars, such as length of gestation, or lactation, &c., may also have an individual as well as a general use. It appears to be a well ascertained fact, that after the Black Death and other great pestilences, women became remarkably prolific.

Admitting the general truth of the principle, that, if man had adhered to rectitude and prudence he would not have become subject to misery, disease, and pain; but that, not having done so, he has become liable to all of these (analogous to the penalties which, even in this life, his moral delinquencies have incurred); we would next inquire, whether our Creator, as in the latter case, has not mercifully provided a remedy for his disasters in his appointed way; and whether He has not, as in the former case, given us modes of relief and restoration, even for penalties which we have brought upon ourselves. We think it will appear that justice is tempered with mercy, and probably it will be found eventually that no disease is without its remedies, no pain without a palliative or a cure. The wonderful discovery of chloroform comes to strengthen our argument on this point. The most incurable diseases are generally what may be called non-natural or abnormal ones, as hydrophobia and glanders, both of which are derived from other animals; or such as appear to be organisms within organizations—as are probably cancer, encephaloid, tubercle, and melanosis. It is questionable whether the plan of treatment pursued by the quack with these latter is not sometimes the most efficacious, destroying their vitality by powerful escharotics, and causing them to drop out, rather than our method of extirpation by the knife.

However this may be, we believe it will appear that diseases are not exactly *disorders*, but have a set course and *order*

of action, amenable to certain laws; there is a *vis medicatrix naturæ* active in such cases, producing a natural tendency to restoration, a principle never to be lost sight of either by the physician or the surgeon, without which all his efforts to restore health will be vain. Derham writes, "As man's body is admirably contrived, and made to prevent evils, so no less art and caution hath been used to get rid of them, when they do happen. When by any misfortune, wounds or hurts do befal, or, when by our own wicked fooleries and vices, we pull down diseases and mischiefs upon ourselves, what emunctories, what admirable passages are dispersed throughout the body; what incomparable methods doth nature take; what vigorous efforts is she enabled to make, to discharge the peccant humours, to correct the morbific matter, and, in a word, to set all things right again."* And Mr. Paget observes, "This capacity of adaptation is shown in a yet more remarkable manner in the recovery of parts from the effects of injuries and diseases. It is surely only because it is so familiar, that we think lightly, if at all, of the fact that living bodies are capable of repairing the effects of injury, and that in this capacity they prove themselves adapted for events of which it is not certain whether they will ever occur to them or not. The exact fitness of every part of a living body for its present office, not as an independent agent, but as one whose work must be done in due proportion with many others concurring in operation with it, is a very marvellous thing; but it seems much more so, that in the embryo, each of these parts was made fit for offices and relations that were then future; and yet more marvellous than all it seems, that each of them should still have capacity for action in events that are not only future, but uncertain; that are indeed possible, yet are in only so low a degree probable, that if ever they happen they will be called accidents.

"Let us have always in mind this adaptation of the living body to future probabilities, while we consider the physiology

* "Physico-Theology."

of repair. If it be fairly weighed, every part of the process of repair will be an argument of divine design, and such an argument as cannot be impugned by the suspicion that the events among which each living thing is cast have determined its adaptation to them, for all the adaptations here noted prove capacities for things future, and only not improbable."*

This principle, too, is the handmaid of all those beautiful contrivances in the healthy body by which its sanity is preserved, so beautifully elucidated by Ray and Derham, Hunter, Paley, and Bell, and indeed admired by all pious philosophers and physicians from Galen downwards. We would give the remainder of this chapter to a more extended examination of this subject, taking surgery principally in preference to medicine, as it has been our own more proper province.

And first, why should pain exist? Did it not do so, we should find a difficulty in ascertaining the existence of disease, its amount, its progression, or amelioration. It is in fact sent to be a guide and a warning. We may observe, that in many diseases its existence betokens that there is yet hope, and when it ceases, so does the prospect of a cure. This is seen in a melancholy way in cases of gangrene, particularly of the bowels; if the pain suddenly ceases we know what has taken place. The excellent Ray observes, "Even pain, which is the most grievous and afflictive thing that we are sensible of, is of great use to us. God hath annexed a sense of pain to all diseases and harms of the body, inward and outward (and there is no pain but proceeds from some harm or disease) to be an effectual spur to excite and quicken us to seek for speedy help or remedy, and hath so ordered it, that as the disease heals, so the pain abates."† And Dr. Duncan observes, "That without pain, sickness would no longer be a corrective lesson—it subdues the

* Paget's Sur. Path. pp. 149, 150.

† " Ray, " On the Creation."

proudest spirit—but it seldom is present unless useful; thus there is seldom pain in mania."

We believe it is also necessary that an injury should be felt by the system and brain. If this is not done, mischief may probably ensue, as trismus or tetanus. This was made an objection to the use of anæsthetic agents, and perhaps with some share of plausibility; happily, however, the objection was found futile. But in this case there is a considerable constitutional effect produced, though not the result of the injury, and with returning sensibility pain also appears, the patient being in much the same situation perhaps, as in a case of injury occasioning insensibility, say concussion of the brain. In many cases where chloroform is used, the system certainly does appear to feel the injury, but the mind seems disjoined from it; in some cases it supposes there really has been pain inflicted, but upon some other individual. The untoward symptoms mentioned above, are considered most likely to occur when an injury has been inflicted either on parts naturally unfeeling, as ligaments or tendons, or where it has been attended with laceration, or in benumbed parts, or lastly, in injury of the nerves.

We have pointed out in another place, that after inflammation and the formation of matter nature wonderfully works to bring that matter to the surface, and that this is accomplished, though a thin membrane alone separates it from some important internal cavity or part. We have shown inflammation also to be but a curative effort of nature. Gangrene in its most lamentable results still offers us examples of her provident power. The dead parts become marked out from the living by the "line of demarcation," and at that spot gradually separate and are thrown off. In gangrene, too, we see a remarkable provision against hæmorrhage during this separation, for what is to prevent the open arteries from bleeding the patient to death? gangrene never takes place without the vessels of the part being clogged to some extent above the line of demarcation with a clot. A

similar thing happens where a limb is torn off; there is in such cases rarely any hæmorrhage; the injury which tears the tissues so much affects the vessels that they appear torpified, and not disposed to carry on the circulation within them, and the blood consequently coagulates. The fainting, too, which occurs in hæmorrhage, materially facilitates the same circumstance.

The different results of inflammation on the various tissues are worthy of notice. If the mucous membranes of the stomach, or bowels, or that of the joints, were subject to adhesive inflammation, the consequences would be disastrous indeed; if serous membranes were not subject to it, the same fatal result would often occur where now no harm follows. The second tendency, accompanied by an ulcerative process, prepares a path, it may be devious or dangerous, for the hepatic abscess, or in some cases prevents extravasation or infiltration of injurious matters, speedily heals the incised wound into the cavity of the peritoneum or chest, and enables the surgeon to cure several diseases. Hydrocele is a troublesome effusion of serum into the scrotum; the surgeon lets it out and prevents such an occurrence for the future by irritating the serous membrane, when the surfaces of the sac adhere, and consequently leave no space to admit of any future swelling.

Instances of the power of nature in remedying the effects of disease of a very simple nature, may be seen in the increasing of the diameter and strengthening of a bone, say the tibia or fibula, when a portion of its fellow is removed for necrosis, an occurrence noticed by Mr. Stanley; in the enlargement of one kidney when the other is wasted by disease; and in the hypertrophy of the muscles of the heart, when called upon to make increased exertions, the valvular outlet being ossified and narrowed.

We believe that we have already made it appear probable that continued and symptomatic fevers are but the manifestations of nature making an effort to relieve the system. In the exanthemata, too, nature is making an effort to

throw off a noxious poison in the form of the eruption. The cure of these diseases is principally "aiding and abetting" these efforts of nature to evacuate the *materies morbi* by the different emunctories.

In the most violent inflammation there is evidently a strong tendency in the system to put on healthy action. How often in treating such cases, say pneumonia or peritonitis, do we find that, if we have once succeeded in making an impression on the system, once stopped the morbid action, either by a free bleeding, or by some other means, the progress to a cure is immediate and uninterrupted, even without our own efforts. This tendency to cure is seen in many or most diseases, and has led some to a pernicious system of medicine called the "expectant method of cure." When nature is directed in her efforts by the thoughtful physician, or rather perhaps when the skilful practitioner is directed by her, there is the best Therapeia. To leave nature entirely alone was not intended, is not consonant with other analogous cases, and would often be a fatal error.

When a wound is received, what are the surgeon's cares without this power of nature? He cleans it, removes sources of irritation or foreign bodies, places the parts in favourable positions and circumstances, keeps them together by straps, or temporary sutures, or bandages, and moderates inflammation by preserving the system cool, but nature does all the rest. She agglutinates the wound by the effusion of coagulating lymph, its walls become firmly knit together, or even without the effusion of lymph, in some cases, by a more immediate union, the inflammation subsides, and the parts are healed by what is called union by the first intention. Or if this does not take place, the gap gradually becomes filled up and covered with small fleshy granulations, then these solidify and contract, the surrounding skin encroaches more and more towards the centre; but if the surface is very extensive, small islands of skin form amidst the field of granulations, and at last the cicatrix appears a mere white line. By the adhesive inflam-

mation, too, the surgeon unites the gaping sides of harelip, and succeeds in those curious and often very useful operations (called Taliacotian from the discoverer) by which deficient parts are supplied from neighbouring ones.

We see the same process in amputation ; but here, to stop hæmorrhage from the divided arteries, we adopt a plan of tying the vessels with ligatures, a method introduced, or re-introduced into surgery by the celebrated Frenchman, Ambrose Paré, and which, if it was not as he said, "an improvement revealed to him from above," appears almost worthy to have been so ; when the artery on the face of a stump or elsewhere is thus tied, the coats of the vessel are pressed together, and adhesion soon takes place, the blood at the same time coagulating in it up to the nearest lateral branch. It is thus firmly and permanently closed, at least if its coats are in a normal and healthy state. The ligature shortly ulcerates away and is discharged with the flow from the wound ; or perhaps the surgeon has left one end hanging out and can draw it away when loose. Nature closes up the wound, rounds the sawn bone, and moulds the stump into a round cushion fit to bear the pressure of an artificial contrivance to supply the place of the lost organ.

Again, if a bone is fractured, it is the power of nature which heals it, though in this case as well as in that of necrosis, there are some varieties in the curative processes according to the nature of the case. The office of the surgeon is to place it in a proper position with the least possible torture to the patient, and to secure it so. Then a fluid is thrown out from either of the ends of the bones and the periosteum. This coagulates and becomes *callus*, uniting the broken surfaces ; the vessels ramifying in it, secrete bone, which solidifies the whole together. At first there may be the feel of a large knot, but in the end this becomes more dense and contracts, all superfluities and redundancies are removed, and the bone becomes strong and firm, with very slight appearances of the fracture.

Or again, a bone is dislocated, and the dislocation unfor-

tunately is not discovered. One would think that after the head of the bone, say the thigh or arm bone was thrown out of its socket on the adjoining surface, with rupture of the capsula and other ligaments, and injury and displacements of those vital pullies, the muscles, that the result would be disastrous and irremediable. But not so ; nature wonderfully accommodates herself to the unnatural position ; the limb regains most of its movements and powers, the muscles lengthen or shorten to adjust themselves to the new state of the limb, a new capsule is formed with all the qualities of the proper one, and like it secreting the synovia or lubricating joint oil, other ligamentous bands strengthen the newly formed joint, and if the head of the bone is thrown on the shoulder blade or hip bone, a new bony socket or cup is formed upon it, strengthened all around with a raised osseous wall. Or in case a portion of the osseous system becomes, from accident or otherwise, useless, it is removed by the absorbents. Baron Larry relates a very striking case in point in his "Military Surgery," where the head of the humerus was driven between the ribs into the cavity of the chest and could not be returned ; some years afterwards the patient died, and on examining the bone, all that portion which had penetrated the chest had disappeared.

Again has a bone, say the large leg bone, received a violent shock or injury, enough to destroy its vitality, or produce necrosis, inflammation is set up, the old bone dies, the periosteum inflames and throws out bony matter in great quantities, which encases the old bone ; abscesses are formed, and the old shaft, called the sequestrum, makes its escape, or is extracted by the surgeon, through some opening formed by ulceration in the new bone. After this happy extrusion the hollow fills up, the rude limb contracts, the bone becomes symmetrical, and the sinuses heal. Afterwards, could the bone be examined, it would be found so restored by nature to its proper proportions, that it could not be distinguished from the other.

Has a joint been so inflamed and ulcerated, or altered in

structure, that it is impossible for motion to be continued (for in that case the altered parts could not possibly bear the friction), what does nature effect in this dilemma? She brings about anchylosis—the bones of the joint, say of the knee, grow together and firmly unite, though they lose the power of flexion and extension; but if the limb has been kept in a proper position it remains useful—the best cure under such circumstances.

Absorption is a vital act, without which no physician could take a step. By encouraging it, he cures a multitude of diseases, removes dropsies, the apoplectic clot, and other morbid deposits. It is of equal interest to the surgeon. It assists him in numberless instances; cataract is one. In that disease the little lenticular body, situated within the eye at the anterior third, and behind the curtain of the pupil, has lost its beautiful transparency and become impervious to the rays of light. Its use being simply to converge these rays, could the cataract be removed, sight would be unaffected, at least by supplying another lens in front of the eye in the shape of the glass of the spectacles. How does the surgeon get rid of it? He avails himself of the power of absorption which the eye, like the other parts of the body, possesses. He passes his couching needle into the lens, pierces it, and endeavours to break it up. This accomplished, absorption very soon commences upon and lessens it, and eventually the pupil is left quite clear and unclouded.

The last instance we shall give of nature assisting the surgeon, is that of the disease called aneurism. This is a dilatation of the external coats of a large artery, from the impulse of the blood, into a tumour containing that fluid. It appears that no structure of the vessel is competent to resist the continuous impulse of the heart's action but its middle elastic coat; if this has become diseased, or if the vessel has been wounded, and at first closed externally by cellular tissue, the pulsatory tumour called aneurism is

formed, and constantly increases from the impulse of the heart, as neither ligament, nor cartilage, nor bone, is able to confine it, for it breaks through these by absorption and constant pressure; certain death is the result when the sac gives way. The cure may be brought about in several ways each one showing beautifully the resources of nature. Can the circulation in the tumour be but a little decreased by constant pressure above on the artery, the blood will often have a tendency to coagulate from being more at rest, and, if this occurs completely, a cure will be accomplished; a hard and diminished tumour being felt instead of a pulsatory one, the artery becoming impervious, and eventually the absorbents will remove the swelling as completely as any other useless and low organized substance. This practice has been lately re-introduced, principally by the Dublin surgeons, and with the most brilliant success. But the cure is effected in another way, by the simple operation (the invention of John Hunter) of tying the artery at a distance above the tumour. The artery in this case is obliterated by the same process as is mentioned in amputation, the adhesive inflammation. Sometimes this coagulation and solidification in the sac, takes place spontaneously, or has been encouraged by galvanism, punctures, injections, manipulations, or some other mechanical promoter of it; sometimes the tumour itself has produced compression of the vessel above, and so obliterated it; sometimes, but rarely however, Valsalva's method of bleeding and starvation has so weakened the power of the heart, that coagulation has taken place. But in all cases when a cure is brought about by obliteration of the vessel, mortification would necessarily follow to the limb, if there had been no provision in nature to continue the circulation by what is called anastamosis. In the trunk of the body, as well as in the limbs, so numerous are the vessels, and so much do they ramify into one another, upwards and downwards, that in every part nature has made a provision in these branches for the continuation of the

circulation, even when the main trunk of the body is obliterated; and if the smaller arteries are not of a calibre sufficient to effect this, they soon become so. If such a system had not been benevolently provided in the system, no mode of cure for this important disease could have been successful.

CHAPTER VIII.

Examination of the principles of Phrenology, Mesmerism, and Hydropathy, &c.—The "Organon" of Hahnemann, and Homœopathy —True animal electricity.

It has been observed that "no medical testimony is sufficient to establish a fact, which is itself incredible, and this previous incredulity can only be ascertained by an extensive and accurate knowledge of the functions and properties of the living body." A sentiment which may be applied to the subjects of this concluding chapter.

Having taken what we hope is a candid view of the prin-

ciples of medicine, and admitted all its deficiencies, we may be allowed, as a necessary and natural sequel, to examine the principles of some other allied sciences, or rather, in most instances, pseudo-sciences, which have become prevalent, and, with some persons, paramount, at the present day.

Phrenology is one of these, requiring from the character of its founders more deference than several of the others. In some respects, indeed, it has done service to medicine and to mankind—it has, or rather its founders have, shown the influence which physical conformation has upon the mind, moral feelings, instincts, and actions of men, and brought forward much that was new or overlooked respecting these. They have, too, added their *quota* to our knowledge of the nervous system. Notwithstanding this we see in phrenology, as has been before observed, what Bacon calls "an over easy and peremptory reduction into acts and methods."* Its advocates should have hailed the birth of the new science, rather than have offered it to our admiration at once, a creation of perfection and maturity. Indeed we believe that certain of its main foundations are faulty, as well as the superstructure raised upon them.

We see on examining the brain numerous curious convolutions, which lie at its basis, on the orbits and ethmoid; others constituting the inferior surface of the middle lobe; those resting upon the tentorium; also the convolutions situated in the longitudinal fissure. These constitute a surface as large as, or larger than, the upper *superficies;* yet of these, as well as of the remarkable island of Reil, the phrenologists tell us little or nothing. At the same time their catalogue of faculties is tolerably complete, so much so, and so precisely localized, that if true the progress of the science must be indeed remarkable; in fact, *so remarkable*, that some have for this reason alone, namely, its very perfection, set it down as a fallacy.

Again, we see the posterior lobes of the brain to be developed in man and the highest quadrumana alone. They

* Dr. Holland.

must therefore be the seat of some of the highest faculties of their nature ; either of those which direct their hands, as constructiveness for instance, placed by phrenologists in a very different situation, or of the intelligence and emotions which they alone manifest. Yet, according to the phrenologists, these posterior lobes must be the locations of philoprogenitiveness, adhesiveness, self-esteem, love of approbation, and inhabitiveness, if not of combativeness, faculties or propensities of the lower, rather than the higher animals. Firmness, conscientiousness, hope, and veneration, are placed by phrenologists in the middle lobe, which may be anatomically proved to be much developed in the lowest quadrupeds. According to Swan, the involuntary, and part of the sensitive columns of the spinal cord, expand into convolutions at this part of the brain.

Phrenologists are probably right in believing the intellectual faculties to have a "local habitation" in the anterior part of the brain ; but one would have supposed those of colour, time, and melody, would rather have been placed near the insertion of the optic and acoustic nerves, than at a distance from them. There are also facts in pathology which would appear to place doubt upon the idea that language is situated above the orbit, loss of that faculty having undoubtedly taken place in these instances, when the lesion has been in a very different part of the brain. But no doubt this faculty may become impaired in various ways—by loss of memory, of words, things, or persons ; by paralysis of the muscles of the tongue, or larynx, or by coma, or other oppression of the mental powers.

Phrenologists make the cerebellum to be the seat of amativeness and philoprogenitiveness, and though it is not impossible that there may be some connexion between them, the anatomy and certain well known experiments, together with some facts in pathology, lead us to conclude, with much confidence, that the cerebellum has rather a connexion with sensation and the muscular sense, and with locomotion. M. Leuret shows that the cerebellum in the stallion is propor-

tionally of a less average size than in the gelding. Neither does the development of the part at all correspond to the development of the peculiar faculty with which it is wished to connect it. Indeed it appears that this fundamental point in phrenology is quite untenable.* Dr. Carpenter observes, "If the evidence at present adduced in support of the phrenological position be held sufficient to establish it, in defiance of so many opposing considerations, we must bid adieu to all safe reasoning in physiology."

That the convolutions are particularly the organ of the intellect we cannot doubt. There appears to be much constancy in the presence of the particular convolutions; there is also much resemblance between those of the opposite sides, and yet as certainly some variation.† It is also possible for the anatomist to arrange and describe them, as indeed was done to some extent by Spurzheim himself, and he accounted for the connexion of the instincts and feelings, and for the association of ideas, by their curious ramifications into each other. Phrenologists, however, do not profess to map out the cranium in correspondence with the convolutions, which constitutes, as we should suppose, an objection to the system, for if these convolutions are the seats of faculties, we may fairly infer that each of the former appertains to one of the latter.

We suppose that the phrenologists maintain that their doctrine is not that every convolution constitutes the seat of a faculty, but that it may consist of portions of two, or of several; yet we must still make deductions for a certain want of correspondence between the brain and its osseous case; well understood it may be, but causing practical difficulties in cranioscopy. It is probable, too, that from pecu-

* See p. 52.

† May not right and left-handedness depend upon cerebral organization? it is owing to something beyond difference in the relative strength of the two extremities, for a child in whom the arm and whole left side are much more developed than the right, is, notwithstanding, right handed.

liarity of family or race, treatment in infancy, or from the particular size, tallness, or breadth of the individual, the skull and brain may have a very different conformation, and yet the faculties be very similar. Width between the ears may betoken a violent and destructive character, not because the brain has destructiveness much developed, but because the circumstance accompanies the osseous and muscular formation of a man of herculean frame, such a one as would have a natural turn for deeds of violence. So a tall and slender individual will often have a high *vertex*, and would be considered to have firmness or veneration large; the short, thick-set individual, often presenting the opposite form.*

According to Foville too, marked distortions of the cranium are produced in some departments of France by the nature of the head-dress worn in infancy. In some skulls we see a remarkable flatness, the floor being raised as it were into the cranial cavity; we might suppose that the carrying of weights upon the head during life might occasion this. In the same race, and even in the same family also, two varieties of cranium are often found, the oval and the round, and one would suppose that in the former the higher parts of the brain, the anterior and posterior lobes, must be most developed.† The modifications of size and shape produced by race are well seen in the extremes, the small Peruvian and the large Saxon, in the prognathous African and the elevated Turkoman. Many tribes of men have strange cus-

* One of our best anatomists has lately pronounced that there is great discordance in details between the surface of the brain and the skull; the internal prominences of the latter being disposed with the view of conveying vibrations towards the sella turcica.

† Hence there may be some correctness, in two ways, in saying of a clever person that he is long-headed. But with respect to a round cranium, who shall decide whether the anterior, middle, or posterior cerebral lobes, are deficient? The long cranium is sometimes called boat-shaped, or kumbo-kephalic, the broad, brachy-kephalic. The varieties are sometimes national ones.

toms of distorting the cranium by artificial pressure; the Titicacans and Flat-headed Indians are well known instances, their skulls having suffered extraordinary pressure before and behind, and being quite thin and translucent above the eyes, with the frontal sinus obliterated. A similar custom appears to have been practised by tribes in Europe in former times. One tribe of North American Indians in Vancouver's Island, mould the cranium into a somewhat different form, the pryamidal or conical, by means of splints of bark bound around it. Some of these races with distorted crania show considerable skill in carving, and are savage and bloodthirsty enough; but it is uncertain what effect, if any, these customs have upon the mental functions. In the European female the skull is smaller and lighter than in the male, the forehead is narrower but not more depressed; on the contrary, it is more elevated or perpendicular. There is frequently a greater lateral prominence about the centre of each parietal bone, which gives the skull when seen from above a slight lozenge shape; there is a smoothness about the occiput not observed in the male, yet there is, notwithstanding this, a decided prominence and fulness of this region, so great, that if you place the skull on a table it will frequently rest on this part, the mastoid processes not touching the table.*

The discovery of the true physiology of the brain ought to make clear its structure, and the use of its different parts, but we cannot say that phrenology has done this. It should also receive confirmation from comparative anatomy, but Vimont and those who have sought to elucidate it in this way have not at all succeeded.

It has been observed that the actions and dispositions of mankind are so acted upon by a variety of circumstances, modifying their natural bent, as to prove a great source of fallacy in phrenology. Again, it has often been said, and the force of the observation cannot be wholly destroyed, that

* We are indebted to our friend Mr. Davis for the principal facts in this paragraph.

size of organ does not necessarily correspond with activity and power. All these things considered, and recollecting that every phrenological decision must have a fair chance of being correct, or partially so, thus weakening the proof of practical experience, we must still hesitate in accepting the science.

Respecting the phrenological arrangements, one of our deepest thinking modern medical writers observes: "The multiform division of those instinctive propensities, though doubtless right in some points, is arbitrary, incorrect, and improbable in others; and even in some material respects very differently stated by phrenologists themselves.* In the the whole arrangement there is a strong flavour of human fiction, a disregard, so to express it, of natural relation and sequence of parts. It is a sort of especial contradiction to the '*principe de la moindre action,*' so generally prevailing through all parts of creation into which we are permitted to look: and it is yet further liable to this peculiar objection, that the limitation of the table of organs is not more reasonable than its extent. The principle of distinction adopted is one which scarcely admits of boundary or exclusion."

The cranioscopists are disposed to leave what are called the general faculties of the mind, reason, memory, and imagination, to the metaphysician. Mr. Abernethy, though he argues against their conclusions, from the periodicity of some of the instincts and other considerations, bears testimony to the acuteness with which Dr. Spurzheim met his objection of this deficiency in the system. Common sense, for instance, he defined to be "a balance of power between the other organs," self-control as "the result of a predominating motive; thus justice may control avarice, and avarice sensuality." Dr. Burrows, in his "Commentaries on Insanity," relates a curious anecdote of Dr. Gall in the *studio* of Chantrey, not quite so favourable to cranioscopy. When asked his opinion of the bust of the eminent mathematician

* We are not sure that this portion of Dr. Holland's observations is quite correct.

Troughton, the doctor pronounced it to be the representation of a poet, and Sir W. Scott's to be that of a mathematician. He also inspected various drawings, and selected one whose ample cerebral development was supposed to be the sure accompaniment of vast talent, but which proved to be a *fac-simile* of the head of the Earl of P—mf—t. As Dr. Burrows does not appear to relate this anecdote on his own authority, we may give only that degree of credit to it which it appears to deserve.

Willis considered the corpora striata to be the seat of common sense, the corpus callosum of imagination, and the convolutions of memory. Some anatomists have placed common sense in the anterior ventricles, judgment in the middle, and memory in the posterior. In some old Italian lines, inserted in the "Curiosities of Medical Literature," the anterior part of the brain is given to the intellect, the middle to conscience, and the posterior to memory. We trust that more light will be cast on this obscure part of knowledge, the anatomy and functions of the convolutions, and if so we do not doubt that even then the names of Gall and Spurzheim will still rank amongst the labourers in the field.

During the last century another science, or supposed science, with much less of good faith, and often accompanied by very questionable practices, has been in vogue, at first on the continent, under the auspices of its inventors, Mesmer and Hehl, and of M. d'Eslon, their disciple We allude to animal magnetism in all its forms. Latterly in this country, the human mind, apparently not satisfied with the discoveries of the age, great as they are, has been equally blindly led by a similar avidity for the spiritual and the marvellous. The religious enthusiast and the sceptic have been equally disposed this way; the latter perhaps from some latent idea that these studies will have the effect of weakening what he considers an erroneous belief. One distinguished advocate of Mesmerism apparently rejects all the truths of Christian-

ity, all systems, all free will, the Great First Cause, creation, revelation, and providential guidance, makes Christ a *clairvoyant*, and compares him to the boy Davis in America. Another eloquent and more judicious writer considers Moses to have been a Mesmeriser. Perhaps these strictures apply with most force to *clairvoyance* and phreno-mesmerism, the latter being the engrafting on a science, itself assailable, of one still more dubious. The phenomena of phreno-mesmerism are so wonderful, so complete, everything that a lecturer can desire to produce an effect on an audience, that this circumstance alone suffices to throw great discredit on them.

Physicians know that there is a class of individuals called nervous, excitable, or hysterical, whose very susceptible nervous system is liable to certain actions, which never occur in those whose will is able to control their sensations and movements. These people of weak volition and reason, but susceptible emotions, sensations, and imaginations, have their cerebral and nervous functions easily excited without any adequate cause—their own ideas, sympathy with others,* the power of fancy, imitation,† or fear, variously influence their bodies and minds, producing all the phenomena which we ever witness as the result of the mutual action of mind and body in health and disease, but in a more serious form in the latter case. False or heightened sensations, convulsions, tetanic rigidity, catalepsy, disturbance of the respiratory function, and of the heart, or sleep, are what we commonly witness from the want of over excitable nerves being controlled by a corresponding mental organization. These constitute the most remarkable of the real phenomena of Mesmerism, and appear to have been produced in the original experiments of Mesmer and d'Eslon, at Paris. The same may be the case in some of the *séances* of the present day, as admitted by Drs. Holland, Carpenter, and others,

* Instances of all these will occur to the medical reader; the effects of sympathy are often seen in a remarkable manner in hysteria.

† Imitation of disease has sometimes brought it on.

but, as far as we can judge, this is commonly the exception, and there is generally an absence of good faith and honesty in such exhibitions, often trickery and jugglery.

Not the slightest proof has ever been shown (even if this would account for the case) of any agent, electrical or otherwise, passing between the operator and the patient, the former of whom produces the effects he desires in the easiest manner, professedly by his *passes*, and demesmerizes, in an equally facile and convenient way, by a few effective waves of the hand or handkerchief. In all their experiments on practised patients it appears plain that the manipulations are but secondary to the intentions of the operator—the experiments are too effective, too much "*coups de théâtre.*" Thus in some cases the patient is dead to all voices but that of the operator; the next moment he is made to hear and imitate all that passes in the room. We know that the mind of one individual can in no case act on another person except through the mind of the second, and that his volition is limited to his own organization, however strong this volition may be. In sleep, when one might fancy that the spirit becomes disembodied in our dreams, and is conversant with the absent, it is evident from the false conclusions that we come to, that these dreams are but incongruous compositions from past perceptions. However, we are not authorized in doubting, in every case, the reality of the symptoms witnessed; what is called Mesmeric sleep, for instance, or somnambulism, catalepsy, or exalted sensation. Dr. Holland considers these phenomena as interesting facts in the history of the cerebral functions. We know indeed individuals at the present time, who have, when non-mesmerized, placed themselves in the same rigid and immovable positions as the Mesmerized patient does, and maintained it longer than the latter, and that apparently with little effort. This is only brought forward to show that every case of catalepsy is not genuine. With respect to the transmission of any new principle, Dr. Holland writes, "There is no well-authenticated fact making it needful

to believe that an influence is received from without beyond those impressions on the senses which are capable, according to the temperament and other circumstances, of exciting disordered as well as healthy actions throughout every part of the nervous system, and especially in the sensorial functions." M. Bertram, a noted Mesmerist, is of the same opinion.*

The experiments of what is termed electro-biology are more extraordinary still, but, if we may judge from many of the exhibitions, even less veracious than those of ordinary Mesmerism. The patient in these cases would appear, after exhausting his sight and volition by a long intense gazing on some small object, to submit himself entirely to the will of the operator, seeing, smelling, tasting, hearing, and feeling, as well as thinking and acting as he would have him do, however absurdly. It is allowable to doubt whether such a power has ever been obtained, except perhaps over imbecile individuals or children, and that by the violent assumption and extreme tone of command adopted by the lecturer.† Too often the patients are voluntarily submitting themselves to the influence of their imaginations or the suggestions of the operator, and could break the spell if they chose; or, what is worse, are deceiving, either for gain, or for the vanity of exciting observation. We have lately seen the detection of an instance of the latter. In one case a Mesmerizer manipulated on one half or side of the cranium, and professed to paralyze, by so doing, one half the body on the same side, and was much surprised when told that according to the laws of pathology the opposite side should

* An eminent physiologist, however, Valentin, observes, "Most of the wonderful phenomena described as results of animal magnetism depend upon conscious or unconscious deception."

† It exceeds the power of the Mesmerizer to convince the patient of the conversion of a solution of Epsom salts into the delectable fluids, which he accomplishes with respect to water. A boy seemed persuaded that he could not pick up a coin, yet we noticed that it was placed to his left side, and his feet one before the other, lengthways—in such a position it is rather a difficult feat to do so with the right hand.

have been affected. Similar exposures have taken place at the Aberdeen Medical School, and of M. Lassaigne and Madlle. Bernard at Manchester, by Mr. Braid ; in the former instance, of the pretension to some mysterious power passing from the operator to the patient at a distance, in this case in another room ; and in the latter as far as *clairvoyance* is concerned. Indeed, with respect to this last supposed phenomenon, and to what may be termed transcendental Mesmerism, we cannot see how a rational mind should uphold them without setting them down to *diablerie*, which, however, if it exist at all in the case, must manifest itself in the pernicious credulity of the minds of such votaries ; and in the evil tendency of such a belief, in leading astray the reason and sapping the grounds of revealed religion. Dr. Holland observes, "There is less distinction between the mind of an infant and that of Bacon, than between the two sets of phenomena, the ordinary Mesmeric manifestations and the *soi-disant* and never-proved clairvoyance."

Mr. Braid, in his interesting little book on Hypnotism, gives a letter from Dr. Esdaile, of Calcutta, in which the latter affirms that he has performed numerous capital surgical operations on patients in the Mesmeric state, and that without pain. We have seen no denial or confirmation of this statement. Mr. Braid, even with his predilection for Mesmerism, evidently receives the statement of his friend *cum grano salis*. In the same work Mr. Braid gives some curious extracts, principally derived from Ward's "History of the Hindoos," relative to the Yogees and Fakirs, who would appear to be capable by abstraction of the mind to produce a sort of automesmeric ecstacy or trance. But a still stranger history is given of one of these men, Haridas, who, if the account may be credited, had the power of producing in himself what might be considered a species of hybernation, during which he required no food, and often submitted to be buried for an incredible space of time.*

Respecting these forms of auto-mesmerism, ordinary Mes-

* Konigberger.

merism, and common sleep, Mr. Wilkinson writes: "The atom of sleep is diffusion, the mind and body are dissolved in unconsciousness; they go off into nothing; through the fine powder of infinite variety, and die of no attention; common sleep is impersonal. The unit of hypnotism is intense attention, abstraction—the personal *ego* pushed to nonentity. The unit of Mesmerism is the common state of the patient, caught as he stands, and subjected to the radiant ideas of another person; it is mediate—or both personal and impersonal. Persons can produce the hypnotic state upon themselves, without a second party; although a second will often strengthen the result by his acts or presence, just as one who stood by and told you, you were to succeed in a certain work, would nerve your arm with fresh confidence." In the state of hypnotic abstraction, according to Mr. Braid, the patient may be enabled to exhibit either great exaltation or depression of the sensorial and muscular power. "The preliminary state (of hypnotism) is that of abstraction, and this abstraction is the logical premise of what follows. Abstraction tends to become more and more abstract, narrower and narrower, it tends to unity and afterwards to nullity. There, then, the patient is, at the summit of attention, with no object left,—a mere statue of attention,—a listening expectant life,—a perfectly undisturbed faculty, dreaming of a lessening and lessening mathematical point, the end of his mind sharpening away to nothing. What happens? Any sensation that appeals is met by this brilliant attention, and receives its diamond glare, being perceived with a force of leisure of which our distracted life affords only the rudiments."* In the same strain the writer of these extracts goes on to describe the extraordinary effects of external objects on the sensations in such a state. Mr. Braid adds, that the phenomena are sometimes reversed, and the abstraction is marked by insensibility, catalepsy, or passive flaccidity of the muscular system.

It is well known in the profession that Dr. Carpenter, the

* Wilkinson in Braid.

eminent writer on physiology, is not wholly incredulous of the claims of Mesmerism. With respect to the higher phenomena, such as reading with the eyes completely closed, discerning words in opaque boxes, giving an account of what is taking place at a distance, or inducing the Mesmeric state, without the least consciousness on the part of the subjects that any influence is being exerted on them, he expresses his conviction "that no evidence of an affirmative kind has yet been adduced, which can be in the least degree satisfactory to a scientific inquirer, who duly appreciates all the sources of fallacy to which these occurrences are open," and that no real case "has ever stood the test of a searching investigation."

But, admitting so much, and "the exposures of certain pretenders," and "the love of the marvellous, so strongly possessed by many of the witnesses of such exhibitions," Dr. Carpenter believes there remains in Mesmerism "a considerable mass of matter which cannot be so readily disposed of."

He compares the ordinary with the "hysteric coma," usually distinguished by "a constant twinkling movement of the eyelids." This last state may often be noticed, but itself is but a simulated coma, the patient certainly understanding much more of what passes than in any real insensibility, and in one or two cases it has been a valuable test with the author.

He admits the fallacy of many of the instances of catalepsy which have been exhibited, yet thinks that it, as well as remarkable exaltation of the senses, takes place in some cases; also somnambulism, or sleepwalking, in a greater or less degree.

The phenomena which are manifested in sleepwalking, however induced, by Mesmerism, electro-biology, the odylic force, or hypnotism, he supposes to be facilitated by a state of expectation, and excited and directed by the suggestions of the manipulator, with whom the patient is in *rapport*. According to Dr. Carpenter, this Mesmeric facility on the part of the patient, is a new achievement in the science, not

existing in former Mesmerism, and only appearing "when once the idea has been put into their (the Mesmerizers') own minds, and thence into those of their 'subjects.'" The sceptic might, therefore, be inclined to withdraw these from "genuine and regular manifestations;" indeed, the Mesmerism of the present day is very different from that of the founder, where sympathy appeared to act a prominent part, and the feelings were principally affected.

Stripped of exaggeration then, Mesmeric phenomena appear curious, but, perhaps, not more so than the well-known Protean symptoms of the hysteric *diathesis*, and of cerebral and nervous excitability, with which they have, apparently, a connexion. They are peculiar, however, in the causes which elicit them—expectation, sympathy, music, and other impressions on the senses (with Mesmer and d'Eslon); monotony of sensory impressions, and surrender of the weak volition and attention to surrounding objects and mental inanition in Mesmerism and electro-biology, but apparently intense concentration and abstraction in hypnotism.

Electro-biology is no sooner on the wane than table-turning takes its place, and requires the demonstration of a Faraday to set the public right. In table-turning parties there are generally one or two weak-minded persons, who cannot exercise that control over the muscles which those of a stronger organization constantly do. Mr. Faraday's experiments clearly show that the hands move the table, and not the table the hands; he thinks, at the same time, that it is not easy for the operators, in many cases, to prevent themselves exerting the lateral traction, and that they do so without any intention to deceive.—at the same time, he expresses himself "greatly startled by the revelation which this purely physical subject has made of the condition of the public mind," and thinks the system of education, forming the mental state of the public body, to be deficient in some very important prin-

ciple. A host of pamphlets have been published on this and other ridiculous delusions and deceptions, in some cases the authors attributing them to supernatural agency. We will not enter into this inquiry, or consider "which of the two is possessed," the table or the turners, or whether the believers in either are not somewhat affected. If such ridiculous wonders as these are practised and believed, and allowed to have their bad effect on the mind and judgment, it is a *self*-delusion; at least, if an evil possession, it must be of the operator, and not of the more innocent and almost as sensible table.*

Two other subjects, of a more practical nature, must claim our notice; and first, Hydropathy, or the curing of all diseases by the sole use of cold water, the invention, as one of our brethren terms it, of "an ignorant Silesian boor." The uses of this element, as a curative agent, have not been quite neglected by the profession; and the same observation applies to bathing in general. We have at least half a hundred English authors on the subject, and many more foreign ones. Sir J. Floyer's† "Treatise" was one of the earliest; in ancient times he set up a sort of hydropathic establishment for the good citizens of Lichfield, on a spot afterwards made sacred to Flora and the Muses by Darwin and his friend Miss Seward, and prettily described by the latter.‡ De Hahn, Hancock, and Dr. Cyrillus, were hydropathists a century before Preisnitz, and advocated the *morbifugum magnum* and *dieta aquea.*§ Dr. Currie introduced cold affusion in fevers, and Cullen employed cold water in dyspepsia. The power of the agent, applied either internally or externally, no one can doubt, whether exerted directly, or indirectly from the

* See "Athenæum," No. 1340.

† Sir J. Floyer was also the author of a curious work, "The Physician's Pulse-Watch." He first described pulmonary emphysema.

‡ Miss Seward's Narrative.

§ Dr. Forbes' Treatise in the "Cyclopædia of Practical Medicine," is marked by good sense, and practical as well as scientific knowledge.

reaction of the system; and in this, as in many other departments of medicine, an acquaintance with the laws of physical agents is necessary to the physician. But it is a Hunter and an Edwards rather than a Preisnitz who has thrown light on the subject. What we are indebted to the latter, and to the hydropathists in general for, is what we may occasionally owe to other charlatanism; viz., directing the attention of the mind to points in our extended professional field, which may have been neglected. Incautiously applied, either by these practitioners themselves, or on their plan, we, in our own limited experience, have seen some mischief—more than one joint affected with caries, as well as internal disease aggravated; yet we doubt not the efficacy of a hydropathic plan in dyspeptic and debilitated subjects, or rather of water for beverage, conjoined with a cold bath, or perhaps safer, cold wet sheets, early hours, temperate habits, and regular exercise.* It is the abuse and extravagance which is often but too evident in the system that is to be deprecated. In the middle of the last century a similar infatuation seized upon the public mind with respect to tar-water, of which the learned Bishop of Cloyne was the cause, by the appearance of his "Siris—the Virtues of Tar-water."

In our observations on Homœopathy we shall, first, review the book of the founder himself, the Organon of Hahnemann, according to Dr. Dudgeon, "the immortal work that contains the full exposition of that glorious and beneficent system of medicine"—"whereof every page abounds in profound and original thought," and which "leaves no point of doctrine unexplained, no technical detail untouched, no adverse argument unanswered." If this book be, as here declared, a fair representation of homœo-

* Perhaps the treatment of chronic rheumatism by the vapour bath, followed by the cold affusion, is an improvement in medical practice which we owe to hydropathy.

pathy, then we must say that, however imperfect the "old system" is, it need not fear being supplanted by her younger sister. Without any intention of retaliating the insinuations which Hahnemann freely makes with regard to legitimate medicine, we may truly observe, that we are totally at a loss what to think of the character of the author.

That highest *desideratum* in practical medicine, which, however, we acknowledge, it is not always easy to attain, but which should always be kept in sight, we mean the fundamental nature or character of a disease, the brain-softening in paralysis, the *virus* in syphilis, the ferment, or something similar, in the exanthemata, the state of the blood in scurvy, the lactic or uric acid, or allied agent in gout, the pus in pyæmia, and other such diseases, the gall-stones, or pressure, or diseased liver in jaundice, the vascular obstruction in hæmorrhage or dropsy, the alcoholic state of the blood in delirium tremens, its over quantity or over animalization in some diseases, or its poverty in others, all this important knowledge, with all that a Morgagni, or Baillie, or Gluge, ever obtained by their researches in pathological anatomy, must be forgotten, and we must look to the external symptoms alone.

Hahnemann denies the existence of a material cause of disease in every case, "since the least foreign material substance, however mild it may appear to us, is suddenly repelled, like poison," by "the indefatigable active vital principle;" and instances the danger of injecting a little pure water, mild fluid, or air, into the veins, all which is in direct opposition to other maxims in the volume. If a little water has proved dangerous, it is because it *was pure*, pints of saline or serous fluids having been injected into the veins, apparently with impunity or benefit; but it is well known pure water has a solvent action on the blood corpuscles. That any quantity of air admitted into the heart, the suction and forcing pump of the blood, with its elaborate valves, might suddenly, and on mechanical principles, stop the circulation, is no wonder. But our author asks us to

show a morbific matter to "corporeal eyes;" surely we can in smallpox, gonorrhœa, or hydrophobia, or possibly in the case of urea and uric acid, or in diabetic sugar. A purpura arising from want of potatoes or other vegetable diet, a jaundice from gall-stones, a dropsy from pressure, are solely derangements of the spiritual power that animates the human body, *according to Hahnemann.*

In the preceding paragraph we read of "the indefatigably active vital principle;" and its existence, even in disease, has been admitted from remote ages. Sydenham observes, that it is the duty of a physician generally, "carefully and closely to follow the path and conduct of nature." We believe that nature averts an apoplexy by a bleeding from the nose; a dropsy by a purging; a paralysis by a natural issue; or by throwing out a poison by the skin; and we venture to imitate her efforts; but this is a grave error, as these "pitiable and highly imperfect efforts" of crude nature, and the "irrational and senseless" vital force, are to be disregarded. How is it that this vital force, so admirable in the state of health in preserving the body, should so suddenly, on the invasion of disease, lose all pretension to any resistance, or cease to be worthy of the notice of the physician as to its efforts? We would also inquire, what does Hahnemann mean by "diseased vital force, or spirit?" "diseased natural force?" and by "exciting in it a medicinal disease?" We consider the essence of the vital force to be a portion of the breath divine bestowed upon our first parents, a ray of divinity itself. Why should we ascend so high as spirit in searching for the cause of disease? How generally does morbid anatomy discover it to us. We can more easily believe that a letter written in a sick room communicates disease by some "material morbific matter," than by anything more spiritual in its nature, though to do so is, according to Hahnemann, an absurdity. To show nature's want of curative power, Hahnemann, most unhappily for himself, points out that "it cannot bring together the gaping lips of a wound, and by their union effect a cure; it knows not how

to straighten and adjust the broken ends of a bone; it cannot put a ligature on a wounded artery, but in its energy it causes the patient to bleed to death." No! nor can it convey our meat and drink to our lips without our own mechanical effort. In the above instances, man's hand having performed the mere mechanical act, we see manifested, in a manner that in all ages has obtained the admiration of mankind, the consummate skill of nature. No, Hahnemann, we cannot give up this principle for your *dogma:* and you, above all others, ought not to require it, for without the *vis medicatrix naturæ*, what would your treatment be?

We do not think it "contrary to nature" to seek to cure disease by an open combat with it, by what Hahnemann terms, antagonistic measures; so far holding the ancient maxim, τὰ ἐναντια τῶν ἐναντιων ἐστιν ἰήματα *contraria contrariorum sunt remedia.* We apply cold to the hot head or skin in a phrensy or fever; a warm bath when the perspiration has been suppressed; we bleed* in plethora or inflammation, and thus destroy the *pabulum* of disease, or in hæmorrhage to take off, by mechanical means, the *vis a tergo;* we give an alkali by a chemical law to neutralize the acid which may be proved to be present; purgatives in constipations; astringents in hæmorrhage or diarrhœa; kousso in tapeworm,† all wrong, according to Hahnemann.

* Hahnemann wonders that we draw blood in a pleurisy, when two hours before the disease arose the calm pulse showed no sign of plethora —do we not do so in such a case to stop the arterial action, rather than to empty the vessels? the efficacy depends more upon the *way* the blood is taken, than upon the *quantity*—and is not our success in such cases a proof of the propriety of the treatment? Hæmorrhage, according to Hahnemann, never depends upon engorgement, plethora, or mechanical obstruction to the venous flow,—but is spiritual in its nature—not to be prevented by bleeding, but by "a small globule of the decillionth dilution of aconite juice!"

† Hahnemann recommends a temporising plan with this parasite, and deprecates the cruel (to the monster?) plans of getting rid of the disease. As they are "harmless," and live "quite quietly," he would only give the smallest dose of malefern, occasionally, to ensure this truce—but they

We have found that we can *citò tutè et jucundè* relieve a colic by a carminative; a syncope by ammonia; a spasm by an opiate; or a gastralgia by a dose of brandy; and we adopt such methods, though they are deprecated by Hahnemann, as merely palliatives. In fact, we adhere to no dogma; neither the one given above, nor the opposite one of the homœopaths, viz., "like cures like;" we avail ourselves of various laws and principles—our remedies may be vital, chemical, or mechanical; specific, derivative, or counter-irritant; diverse enough, at any rate, to prove that we are less systemists than the homœopaths themselves; a point on which they attack us.

According to Hahnemann, all medicines must be directed solely to the symptoms, and must be of such a nature as to produce the same symptoms in a healthy person. Hence we see why they find it necessary to confine themselves to the external or ultimate symptoms, for what drug will produce a hydrothorax, or internal scirrhus, or hydrocephalus? But without these morbid states or changes, their natural associations, functional symptoms, must be vague: a vomiting, for instance, even conjoined with headache, dyspepsia, and fever, may depend upon mischief either in the head, stomach, liver, or kidneys. And what is more, we affirm that there are no medicines known which on the healthy individual will be homœopathic, that is, produce the same or similar disease. What medicine will produce a hoopingcough, or smallpox, or scrofula? Mercury, lead, arsenic, opium, quinine, strychnine, emetics, purgatives, or diuretics, though they produce effects violent enough, do not produce the exact symptoms of any disease. Were they ever supposed to do so before this new system existed? The effects of strychnine or lead might be thought an exception, but they are specific enough to be distinguished from idiopathic disease. Neither can we give the above theory of the cura-

are to be finally cured by the psoric treatment—for to the psoric taint they are owing! We have tried the kousso in tapeworm, and found it efficacious and permanent in its effects.

tive power of medicaments the credit of being a natural one, nor *à priori* a likely one; our mode is certainly more direct, more natural, and more to the purpose; and so much is this the case that strong proof of its rival's truth ought to be forthcoming.* In one respect only does there appear any truth in the doctrine—if a medicine shows the power of acting on some particular tissue or organ, as iodine or mercury on the glands, opium on the nerves, or ipecacuanha on the stomach, such medicines will affect those parts when diseased; this peculiarity of the medicines having been always understood.

To ascertain the "pure" effects of drugs, or what he calls their pathogenic power, Hahnemann experimented on himself and certain young men; the results, besides being indelicate, are, in our opinion, curious enough to rank amongst the strangest of the German vagaries. Arnica caused 355 symptoms, amongst others, vertigo, disturbance of mind, heat in the head and pain, heat of face, contracted pupils, vomiting, tormina, convulsions, eruptions, fissures of lips, diarrhœa, dysury, &c., and cough. What disease is this? Belladonna presented 685 symptoms; mercury nearly 1000;† 720 symptoms have been produced by the millioneth of a grain of animal charcoal, 190 by the same dose of vegetable ditto. This system of minute doses, to which allusion is here made, must have been intended by the high priest of homœopathy as the touchstone of his disciples credulity. It is curious to see how the man, who has ventured

* Speaking of our endeavours to ascertain the fundamental nature of a disease, Hahnemann asks, what should we think of God's "wisdom and goodness, if He had shrouded in mysterious obscurity that (symptom) which was to be cured in diseases," &c., we concur in the sentiment; and it applies with equal force to his plan of cure. To effect a cure we must find a medicine which can itself produce a similar disease, according to Hahnemann—no wonder that before him no one "ever taught this homœopathic mode of cure."

† Amongst others, itching of the internal angle of the left eye, itching in a wart on the finger, repugnance for butter, obstruction of the left nostril for an hour, speedy loss of appetite by eating.

to disregard the labours and opinions of ages, should maintain his own infallibility in such a peremptory manner. He tells those whom he calls "mongrels" of his school, that "it will continue to hold good as a homœopathic therapeutic maxim, not to be refuted by any experience in the world, that the best dose of the properly selected medicine is always the very smallest one of the high dynamizations." Did he adopt this infinitesimal system out of regard for his race? or did he see in it a safe refuge for the consequences of his theory? for we may with safety dare the homœopaths to administer their medicines in ordinary doses: they dare not give a full dose of opium in coma, of brandy in phrenitis, of salts in dysentery, or emetic-tartar in cholera. Hahnemann chooses his medicines from their effects on healthy individuals; we, from their action on the disease, which we attempt to cure—is our plan the most "senseless?" Is it sure that the actions of medicines in the healthy body will continue the same when it is disturbed by a fever or inflammation? and if changed, they are no longer homœopathic. We have seen strychnine fairly tried, for thirty days, on a patient who somewhat presented the symptoms which the medicine causes, without the least effect; and M. Andral tried the effect of quinine on himself without its producing the symptoms of intermittent fever; and the power of homœopathy on 130 or 140 hospital patients, in the presence of the homœopaths themselves, without any good result. We have tried some of his medicines in full doses, hyoscyamus and belladonna, for instance, on the healthy individual; the symptoms have been such as are commonly described, vertigo and sleep—the effects of opium, with some dryness of the mouth, but not as the homœopaths would have them—resembling those of hydrophobia.

It is not true, strictly speaking, that a disease is exactly represented by the symptoms. An individual may have hydrophobia or epilepsy latent in the system, or a curable disease, as syphilis. Also to choose our medicines entirely by these symptoms, is truly the palliative method of cure,

deprecated by our author—analogous (Hahnemann is fond of far-fetched analogies) to similar modes of curing moral and political disorders in the world. To throw our purse to vagrant beggars in hopes of alleviating the ills which the vices of the drunken and dissolute have brought upon themselves—to bribe the complaints of the disaffected—are not the radical cures of the evils which cause them.

With respect to the *modus operandi* of his medicines, Hahnemann supposes that the vital force is "compelled" (how ?) to overcome the stronger medicinal disease, and with it the original one. Why should it be able to overcome the stronger and not the weaker ? and, amongst the countless forms and degrees of natural disease, none ? In what is the incurable peculiarity of the latter, particularly if symptoms alone constitute the disease ; and is not such reasoning pure hypothesis ?

Hahnemann endeavours to show an analogy of his version of the action of a medicine to the supposed fact, that certain diseases are incompatible with the existence of others, when both are of a similar nature The principal instance given is that of vaccine and smallpox, an ambiguous case, as most medical men think the two diseases to be in reality the same. We do not deny the Hunterian doctrine of the incompatibility of diseases with each other, but do not see that Hahnemann has thrown any additional light on the subject by limiting the circumstance to the case of *two similar* diseases : and we do deny that homœopathic medicines, and particularly globules, can take the place of one of them. With respect to the smallpox and vaccine, the question is rather in regard to the present mutual effect upon each other, or their incompatibility with each other, than to the future protection from either complaint. Like the other exanthemata they commonly affect an individual but once. Chickenpox is a very similar disease to smallpox, yet it has no more preventative power over the latter than the other exanthemata have. We may well grant that a previous disease will repel a new dissimilar one, if

the former is the stronger. Instances given by Hahnemann are when persons affected with scurvy or herpes escape the plague; granting what may be thought questionable, that the former are stronger than the latter, this would be an argument against homœopathic globules, and for our powerful medicines. We may grant, too, that a new and strong dissimilar disease will suspend an original weaker one; as, according to Hahnemann, ringworm will epilepsy; we may also grant that the original disease may generally return;—*as far as this goes* it is an argument for our treatment in the case of counter-irritants, issues, &c.; which things, we commonly consider, quite in accordance with Hahnemann's doctrine, as merely temporary *adjuvantia.* It remains to be proved that our medicines are of analogous actions to such disorders, or always operate by causing disease; in fact, we opine they cure in very various ways. Neither do we see it necessary to deny that two dissimilar diseases, or a disease and the effect of the medicine, may combine and form one.* But, besides the case of cowpox, Hahnemann's argument for his views rests upon the following instances—smallpox is often attended by ophthalmia, and inoculation has, in two individuals, cured that, as well as amaurosis! He instances also deafness, dyspnœa, orchitis, dysentery, and cutaneous eruptions, as sometimes caused as well as cured by it. "The cowpox, a peculiar symptom of which is to cause tumefaction of the arm, cured, after it broke out, a swollen, half-paralyzed arm!" Measles have cured a herpes or chronic eruption in the face, because the diseases resemble each other? But our author thinks the exanthemata dissimilar diseases from each other, and therefore that they may exist together, or at least that they will only temporarily suspend each other.†

* Probably two similar ones may do the same, as syphilis and scrofula, though, according to Hunter, not in the same part.

† The smallpox merely suspends the measles, yet it certainly should destroy its existence in the system and prevent its appearance—for "a weaker affection is extinguished by a stronger one if the latter, whilst it

Surely such facts as these are not proofs, "clear as daylight," of Hahnemann's views. At present we only know that diseases, even dissimilar ones, have often the power of curing, alleviating, or postponing, each other.

His other series of proofs is derived from an extensive search into ponderous *tomes* of medical literature in which the authors speak of certain medicines curing diseases, one or more symptoms of which they have once or twice, or occasionally, been noticed, generally by other authors, and in different doses, to produce. In such a wide field as the effects of medicines, as recorded by different authors in so many centuries, proofs might be collected to prop up any system of medicine, in fact they constitute one of the greatest *opprobria* of the profession.

We must surely have some stronger proofs than these of his great principle. They are proofs of the acknowledged uncertainty of such sciences as ours, of the varying actions of medicines according to the state of the constitution, temperament, or disease, and of the many unaccountable things found in medical authors (particularly the old, and more especially the German ones) and of nothing more. But, in fact, nearly all the instances are very explainable (no one except a homœopathist can doubt it) by the acknowledged principles of our art. Several of these cases are instances where purgatives have cured dysenteries and colics, or where narcotic, or narcotico-acrid drugs, or nerve medicines in ordinary doses, have shown sanitary powers over symptoms which they apparently produce in large ones, such as vertigo, nausea, or convulsions;* as we see a glass of brandy relieve symptoms which half a bottle would produce; or as "Diemerbroeck, when attacked with those very symptoms of vertigo, nausea, and anxiety which a poisonous dose of tobacco produces, in the course of his close attendance on the victims of epidemic diseases in

differs in kind, is similar in its manifestations." The last characteristics exactly apply to the exanthemata.

* He instances Agaricus muscarius.

Holland, removed them by smoking tobacco!" He solaced himself, perhaps, with a cigar. Sudorifics, as Sennert observes, cured the sweating sickness; but was not this disease a fever, and the sweating a curative effect of nature? Such was the opinion of those who observed it, and also of Dr. Caius.* Again, an essential oil may relieve a colic, taken in a moderate dose, in a large dose it acts as an irritant, and causes the complaint. With respect to millefoil, Arbutus, pimpernel, parsley, Euphrasia, Dulcamara, Ulmus,† and rose-water, to which might perhaps be added, Dictamnus and Clematis; we may venture to give Hahnemann all the advantages he can derive from their virtues. In several cases it appears that the internal and external use of the medicines have been confounded, which we cannot allow.‡ Again, scilla may aggravate, or possibly produce, a pleurisy or peripneumony, which it may cure at a later period by diuresis or expectoration. Ipecacuanha causes an asthma or bronchitis § by its smell, like many other odorous substances, but it will also cure one by nauseating or expectoration. Cinchona, when improperly given, everybody knows, produces fever, indigestion, and debility: we may surely believe all this without dreaming of Hahnemann's law. With respect to belladonna few will believe that it cures hydrophobia, as he attempts to prove it does. Sulphur relieves constipation and hæmorrhoids, but may cause tormina and tenesmus; but this is, probably, when unprecipitated sulphur is given in large quantities, and produces a degree of mechanical obstruction, which latter we think we

* He "let out the venime by sweate, according to the course of nature."—"A Conseille against the Sweate," by John Caius.

† We should be disposed to give the elm-bark a trial, in large doses, in secondary symptoms. It contains much soluble matter, and, perhaps, might take the place of sarsa. The Clematis has some acrimony when chewed. Dulcamara and millefoil appear to be, both, rather inert remedies.

‡ Thus Sambucus niger, according to Hahnemann, cures the dropsy, because externally applied it produces œdematous swelling!

§ It may also cause a hæmorrhage by the action of vomiting, or cure one under other circumstances, as tartar-emetic does by nauseating.

have observed. With respect to cantharides and savine we have seen their effects, both as poisons and medicines; the latter destroying as a narcotico-acrid. Both medicines are of service in atonic cases, and the latter might be useful in repressing hæmorrhage; also, perchance, where the mucous membrane is inflamed—mucous inflammation being relieved by stimulants; not, we opine, under the opposite circumstances.*

We might follow Hahnemann through his list of mineral remedies, his statements being still more absurd. In no case does he give an epitome or statement of the principal symptoms produced by them on a healthy or sick person, one or two only of the many symptoms are brought forward, and those probably, unusual ones, and dependent upon idiosyncrasy, and from such circumstances the virtues of the medicines are accounted for. A copper coin once, swallowed accidentally, produced an epilepsy (very probably), and hence it (salts of copper we suppose) cures chorea. Lead produces colic and constipation, and therefore these diseases may be cured by pills of metallic lead!

Mercury, too, with its manifold powers of good and evil, is an equally edifying theme, as well as electricity and Mesmerism.

* Hahnemann inquires—"How is it that in the early dawn the brilliant Jupiter (the disease?) vanishes from the eyes of the beholder? By a stronger very similar (identical) power (the homœopathic globule?) acting on his optic nerve, the brightness of approaching day." "In situations replete with fœtid odours wherewith is it usual to soothe effectually the offended olfactory nerves? with snuff, which affects the nerve of smell (?) in a similar but stronger manner." One would have supposed that lavender-water would have been the more correct remedy. He also compares diseases to the roar of cannon or the shrieks of the dying, and their homœopathic remedies to the music of the fife and drum—to mourning and sorrow, and the globules to the same misfortunes happening to another, or even fictitious ones—the former again to the dangerous effects of too great joy, and the latter to the exhilarating cup of coffee—to the centuries of German apathy and degradation, in opposition to the still greater slavery imposed on them by the Western Conqueror. We may admire Hahnemann's fancy and nationality, but we cannot consider such analogies tantamount to proofs.

According to Hahnemann wine was given by Asclepiades* in fever attended with delirium, stertor, &c., the symptoms of deep intoxication (sometimes of great debility?). Hyoscyamus cures mental derangement originating from jealousy, because, given as a poison, it has produced a sort of insanity attended with jealousy. Sumach cures insanity and mental imbecility, because a person who had taken an overdose of it had great muscular prostration, and thought he was at the point of death. Again, with respect to arnica, which every homœopathic Lady Bountiful now carries in her pocket, we read, "Persons who have received a blow or a contusion feel pains in the side, a desire to vomit, lancinating and burning pain in the hypochondria, all of which are accompanied with anxiety, tremors, and involuntary starts, similar to those produced by an electric shock, formication in the parts that have received the injury, &c. As the Arnica montana produces similar symptoms (he observes, in his Mat. Med.), it may be easily conceived that this plant will cure the effects of a blow, fall, or contusion, "as is familiar to a host of physicians, and even of whole nations, for centuries past." If we apply arnica instead of opodeldoc, the next time we sprain an ancle, it will be on the faith of the host of physicians and the whole nations, and not of Hahnemann's curious reasoning.†

* We could imagine that the above is not all which was borrowed by the Saxon from Asclepiades—there is evidently a strong likeness between the two. Asclepiades was adverse to surgical operations; his was a new method, in which atoms acted an important part—he showed the same arrogance of spirit in condemning all that was known before him—he divided diseases into acute and chronic—did much by diet and regimen, and gave no efficient medicines—he laughed at Nature, and maintained that she did no good in disease—he also had the fancy that one fever cured another—was an enemy to purgatives and emetics, and an admirer of cold water. Le Clerc gives a portrait of Asclepiades from a bust discovered at Rome.

† If colchicum produces a continual desire to urinate, and the flow in small quantities of urine of a fiery red colour, it must possess some exciting power over the kidneys, and given in large doses might cause inflammatory action, and put a stop to the secretion; such properties are far

But though ordinary medical philosophers may not speculate on the fundamental nature of disease, Hahnemann may do so, and his vaunted theory of chronic disease is the splendid result. All chronic maladies, he says, arise from the uncured rankling in the system of three miasms, the syphilitic, sycosis, or the condylomatous, and psora, or the itch disease ! Perhaps we might not be disposed to dispute the first being a fertile cause of disease ; the second, it must be admitted, constitutes a remarkable discovery, the sycosis or chin-welk, probably from the irritation of the razor principally, and condylomata or warts from local irritation, having never been considered of so poisonous a nature.* But in Hahnemann's words, "Incalculably greater and more important is the chronic miasm of itch"—"the only real fundamental cause and producer of all the other numerous, I may say innumerable, forms of disease." He mentions "nervous debility, hysteria, hypochondriasis, mania, melancholia," also epilepsy, caries, cancer, gout, jaundice, dropsy, asthma, deafness, catarrh, amaurosis, calculus, paralysis, and a host of others, which we cannot enumerate. Is it possible that a medical man could bring his mind to believe all this ? Certainly psora is an "extremely ancient infecting agent," or as Trinculo says, "a very ancient" and "a kind of, not of the newest" disorder.† Is this to continue the great, the sole discovery for which we are indebted to the homœopathists ?

If we add, in few words, that it is perhaps not certain that nitric acid will produce or cure salivation and ulcera-

from being the abnegation of ordinary diuretic effects in smaller doses, and of its curing the dropsy. But Hahnemann's account of the properties of this drug do not at all accord with the best writers on Materia Medica.

* Some, however, have considered these as syphilitic, we think erroneously.

† Hahnemann writes, "Even a (primary) itch eruption of recent origin, though it may have spread all over the body, may be perfectly cured in persons that are not too weakly, by a dose of tinct. sulph. X° given every seven days, in the course of from ten to twelve weeks."

tion of the mouth; still less so, that potass will cause or cure tetanus, arsenic cancer, or tin phthisis; and that it is not proven that a bath of 100 degrees is good in the hot stage of fever, or hot fomentations in cephalitis, we have given an answer, we believe, to all the cases brought forward in the "Organon" as proofs of the doctrine.

And now for Hahnemann's pharmacy. Two drops of the fresh vegetable juice (of a medicinal herb) mingled with equal parts of alcohol, are diluted with ninety-eight drops of alcohol, and potentized by means of two succussions, whereby the first development of power is formed, and this process is repeated through twenty-nine more phials, each of which is filled three-quarters full with ninety-nine drops of alcohol, and each succeeding phial is to be provided with one drop from the preceding one, and is, in its turn, twice shaken; at last the thirtieth development of power (potentized decillionth * dilution) is obtained, which is the one most generally used." Powders are to be potentized by trituration for three hours, up to the millionfold puverulent attenuation, and of this, one grain is to be dissolved and brought to the thirtieth development of power by means of twenty-seven attenuating phials, in the same manner as the vegetable juices.

The above succussions and triturations form an important part of Hahnemann's pharmacy: arguing against certain disciples who carried their physic in their pocket, and thereby dangerously potentized their drugs, he observes, "I dissolved a grain of soda in an ounce of water mixed with alcohol in a phial, which was thereby filled two-thirds full, and shook this solution, continually, for half an hour, and this was a dynamization and energy equal to the thirtieth development of power."†

* A decillion is the number 1 with 60 cyphers!

† As if Hahnemann had not already gone far enough, in the latter part of his life he discarded the swallowing of his globules altogether—the patients were to take one or two sniffs or smells, with one or both nostrils, at a globule of sugar moistened with the potentized solution, or at one or two dissolved in half an ounce of liquid.—Id. Op.

For the putting such trash as this on paper, he argues, that however minutely divided and largely diluted a grain of medicine may be, each portion of the product contains a minute quantity of it, which we are ready to grant—also, we grant, a *corresponding* quantity of medical power—but the latter, of course, too minute in one of his doses to affect even the organization of a mite : for all we know of the medical and chemical properties of matter tend to show us that they are, in the same substance, in proportion to the quantity present. But caloric and light, he observes, are quite destitute of weight, yet very powerful in their action. But in homœopathic quantities even their "potencies" would probably be unappreciable ; but being destitute of weight (and hence, one should have supposed, not analogous) we cannot apportion them by scales, and therefore must leave it to the reader's calculations to ascertain whether the quantity of light or heat analogous to a drop or globule of the decillionth dilution, or, to be more precise, say as much as is produced by the combustion of one of Hahnemann's doses of phosphorus or sulphur, can be supposed to have an effect on the nerve or retina even of a minute insect. Again, "the irritating word which causes a bilious fever," must, we opine, be accompanied with much of feeling or passion, relating to the past, present, or future, before it can do so—a word is often something more than a homœopathic dose. It is also non-proven that contact with a strong magnet for a quarter of an hour, or with the thumbs of a strong-willed mesmerizer, will have a great effect—but of this we have spoken above. At any rate, we maintain that we must calculate the effect of the ponderables, chemically and medicinally, by measure and balance—*Ex nihilo, nihil fit.*

With respect to the solution of carbonate of soda, mentioned above, the only virtue we know of belonging to the drug, is the neutralization of acid, whether in the shop of the apothecary, or the laboratory of the stomach, or in the system elsewhere. However, if we are disposed to believe

Hahnemann, before we use his highly potentized solution, it is very necessary that he should inform us what quantity will saturate a scruple of gastric acid, or half an ounce of lemon juice, so as to form an effervescent draught; and we would respectfully suggest that his disciples should alter the scale of chemical equivalents.

We have in the preceding pages confined ourselves to a *critique* on the "Organon," supposing that it stands before any other work on the subject. No reasonable person, who is by education competent to decide, can doubt that the system is a complete delusion, and its method of cure a purely *medicine expectante.* With attention to diet and regimen cures will be effected either by this, or any other harmless doctrine, by the power of the despised *vis naturæ* alone: but cases will constantly occur where such a plan would be ruin, and where skill and scientific treatment can, on the contrary, do much, and make many cures, as indeed Hahnemann himself admits, in acute diseases, which are commonly very wisely left to the "legitimists."

The homœopaths have appealed to statistics as a verification of the efficacy of their treatment. On this point we would refer the reader to a triumphant article on "Homœopathic Hospital Statistics," by Dr. Gairdner, an able and eminent pathologist,* published in the "Medical Times and Gazette," of April 3rd, 1853. We take the liberty of extracting the following epitome. Assuming the most perfect good faith on the part of the homœopathists, that they have avoided applying formidable names to slight diseases, and that it never occurred to them, any more than to the ordinary hospital attendant, that the stability of the system depended upon the results shown to the public and the government; admitting the number of admissions, cures, and deaths, to be genuine, also granting that the average of mortality is less at the hospital in question (Fleischmann's Homœopathic, at Vienna) than at the General Hospital in the same city, or in fact than at one of our own large hos-

* Distinguished also for his researches into the pathology of cholera.

pitals, yet the average of mortality as shown by themselves is, under the circumstances narrated, enormously high, despite their vaunting tone. Such institutions as general hospitals are well known, easily accessible, and receive the most desperate, the most poverty-stricken, the most abandoned and forlorn cases. Thus many of the small provincial hospitals of England, of the same size as Fleischmann's, have a mortality only of from two to three per cent., whilst in the large ones of our cities it amounts to from five to twelve. The Vienna homœopathic hospital has a mortality of 6¼ per cent., is not in, but near a city, having already hospital accommodation on a prodigious scale, well known to the poorer classes, and adapted to their wants. Its distance keeps away the severest cases, and its superior accommodation attracts many whose trifling illnesses and better *status* prevent their entry into the old institutions. Dr. Gairdner next compares the tables of Fleischmann's Hospital with the one at Edinburgh, which has the reputation of the most open doors with the highest mortality in this country. He admits that this mortality is nearly double at the latter; but he shows that the chief sources of death in our hospitals form comparatively a very small *item* in the list of the homœopathic hospital. These diseases at Edinburgh make half the deaths; excluding epidemics and phthisis, about a quarter of them.* The same is the case in all hospitals, and at the General Hospital at Vienna. The Homœopathic Hospital must either avoid them, or they do not apply to it, as is evident from the following table :—

VERY DANGEROUS OR FATAL DISEASES.

	Edin.	Hom.
Phthisis pulmonalis - - -	276	98
Disease (organic) of heart -	159	15
Bright's disease - - -	82	0 !
Paralysis - - - - -	103	5
Apoplexy - - - - -	14	9
Disease (organic) of liver - -	33	1

* Phthisis causes one-third of the deaths at the Vienna General Hospital.

Again,—

INCURABLE AND INTRACTABLE DISEASES.

	Edin.	Hom.
Internal aneurisms - - -	18	1
Diabetes - - - - -	17	0
Amaurosis - - - -	15	0
Caries and Necrosis - - -	57	5
Malignant tumours - - -	55	0
Other tumours - - - -	36	0

No wonder if with such a difference in the cases the mortality had been much more than doubled!

LESS SERIOUS AND TRIFLING DISEASES.

	Edin.	Hom.
Chlorosis, &c. - - - -	48	90
Colic - - - - -	10	45
Diarrhœa - - - - -	28	114
Erysipelas and erythema - -	82	212
Headache - - - -	37	61
Herpes - - - - -	1	20
Cynanche tonsillaris - - -	34	301
Influenza - - - - -	0	52
Varicella - - . - -	2	110

In the above tables the numbers of the larger and smaller hospital have been compared by comparing two years of the former with eight of the latter, which happens to make the numbers correspond.

It appears that nearly one half of the diseases at the homœopathic establishment are of the easily or constantly curable kind, such as are never admitted into one of the regular hospitals from their trifling nature. They have, however, 300 cases of pneumonia, more than 200 of pleurisy, and more than 100 of peritonitis. In the first case they have committed what, according to Napoleon, is "worse than a crime—a blunder," as they give only 15 as the number of the far more common and less serious disease—bronchitis. We hence know what their pleurisy also must be,

and we may form an idea of their peritonitis. When compared with hospitals of the same size in England or Scotland, the mortality of the homœopathic one is very high, particularly when the preceding observations are taken into consideration. Dr. Gairdner finally makes some observations on the amount of cures, which are 92 per cent. The deaths being $6\frac{1}{4}$ per cent. it follows that there is scarcely any medium between death and cure. Any one who knows what hospital practice is, will see from this the character of their statistics. In the Report of the Dumfries Hospital, which is of the same size, the cures are only 76, with the deaths the same as at Fleischmann's. If so many more could be cured why was not the mortality lessened? The homœopaths are between the horns of a dilemma. Either the cases were really curable in an enormous proportion and they must be responsible for an appalling mortality, "or the alleged cures are a mockery and a delusion, inconsistent with nature and fact, and cunningly dressed up for the indiscriminating wonder of the multitude."

At the Infirmary with which the author is connected, the North Staffordshire, the mortality is much higher, in fact twice as high, as at some of the smaller hospitals of England, it being situated in the heart of an extensive mining, manufacturing, and railway district. It contains 122 beds. The number of patients admitted during the eight years ending October 25th, 1854, was 6,307, or pretty nearly the number taken by Dr. Gairdner for comparison from Fleischmann's. The deaths at the North Staffordshire Infirmary are $6\frac{3}{4}$ per cent., or the half of one per cent. more than at the other. But no wonder!—the Vienna institution had but 98 cases of phthisis, the North Staffordshire 358; diseases of the heart, V. 15, N. S. 109; paralysis, V. 5, N. S. 75; Bright's, kidney, &c., V. 0, N. S. 47; diabetes, V. 0, N. S. 19; caries and necrosis, V. 5, N. S. 119; malignant tumours, V. 0, N. S. 36; diseases of the liver, V. 1, N. S. 83. In the North Staffordshire Infirmary there were received also 297 cases of burns and scalds, and these commonly from explo-

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sions in mines, and of a very fatal character; also 77 compound fractures; 201 cases of diseased joints; 33 of lead poisoning; 14 of strangulated hernia; 13 of vesical calculus. The burns alone would probably make a difference of more than one per cent. By a rule of the Infirmary, no one can be admitted as an in-patient who may as well be relieved as an out-patient. Hence the cases of chickenpox are N. S. 0, V. 110; sore-throat, N. S. 27, V. 301; headache, N. S. 0, V. 61; gout, N. S. 4, V. 140; with respect to peritonitis (27), pneumonia (46), pleurisy (15), and bronchitis (207), the numbers confirm Dr. G.'s remarks. We may also finally inquire how it is that out of more than 6,000 patients at the Vienna Hospital, there were but five of paralysis, and the same question may be asked with regard to other serious diseases, as malignant tumours. Such a statement, if it does not arise from the diseases of the patients being of a very minor degree of severity, is contrary to the laws of disease, and we hence conclude that homœopathic practice is a *bagatelle*, and that very few with serious diseases are so weak as to trust it.

To deny that in Mesmeric passes there is proof of any fluid or agent, electrical or magnetic, or of any influence whatever passing between the magnetizer and the patient, does not entail upon us the necessity of denying that a true electricity exists in animals. It has often been witnessed in human beings under the form of sparks, passing between the body and external objects, and man requires only to be isolated for it to be manifest at any time by means of the galvanometer. Electrical fishes are a well-known instance also in point, the electricity in their case exhibiting all the usual characters which it ordinarily presents. The electrical state of the atmosphere evidently affects the cerebro-spinal system of some individuals, and the chemical actions and changes of form going on in the body must produce electrical disequilibrium, as we may see out of the body in chemical operations, or in the rising of steam from the cap of the

gold-leaf electrometer. But electrical disturbance is manifested in animal bodies in a more curious and interesting way, and principally as connected with the muscular and nervous tissues, and a new science has arisen consisting of this class of facts, originated in the discoveries of Galvani and Volta, with respect to the curious contractions which take place in the muscles of a frog, when its nerves are manipulated upon, so as to disturb their molecular electrical state. If we lay bare the sciatic or crural nerve (Plate IX. Fig. 7), and touch two points of it, or of nerve and muscle, with dissimilar metals, zinc and copper, or, still better, zinc and silver, or gold, the metals themselves being in contact at one point, or at least joined by a conductor, convulsions take place, particularly upon closing the circle, and especially if the nerve is electrified peripherally, or in the regular course of the so-called nervous fluid: if, in the contrary direction, very likely at opening the circle. The metals need not touch the nerve except mediately, as through another separate semicircle of nerve touching the first at the ends, and itself electrified by the pieces of metal;* or two individuals may hold the limb of the frog, the one by the nerve and the other by the toes, when, holding the metals in the other hands, and making them touch, convulsions take place; if, however, the little fingers of these two hands be moistened and brought in contact, no contractions happen, the electrical disturbance taking place, of course, in the shortest circle. These experiments only rank with the well known effect on the optic or lingual nerve, when we connect pieces of zinc and silver, the one placed above, the other below the tongue. Volta's discovery of the galvanic pile, &c., nipped in the bud this interesting branch of practical physiology, as it was at first overlooked that metals were not necessary at all to produce contractions. It may be easily shown by placing one end of the frog's prepared extremity in a glass of salt-water, and the other in a second, that contractions take place on connecting the two glasses

* This was, perhaps, an electro-tonic effect.

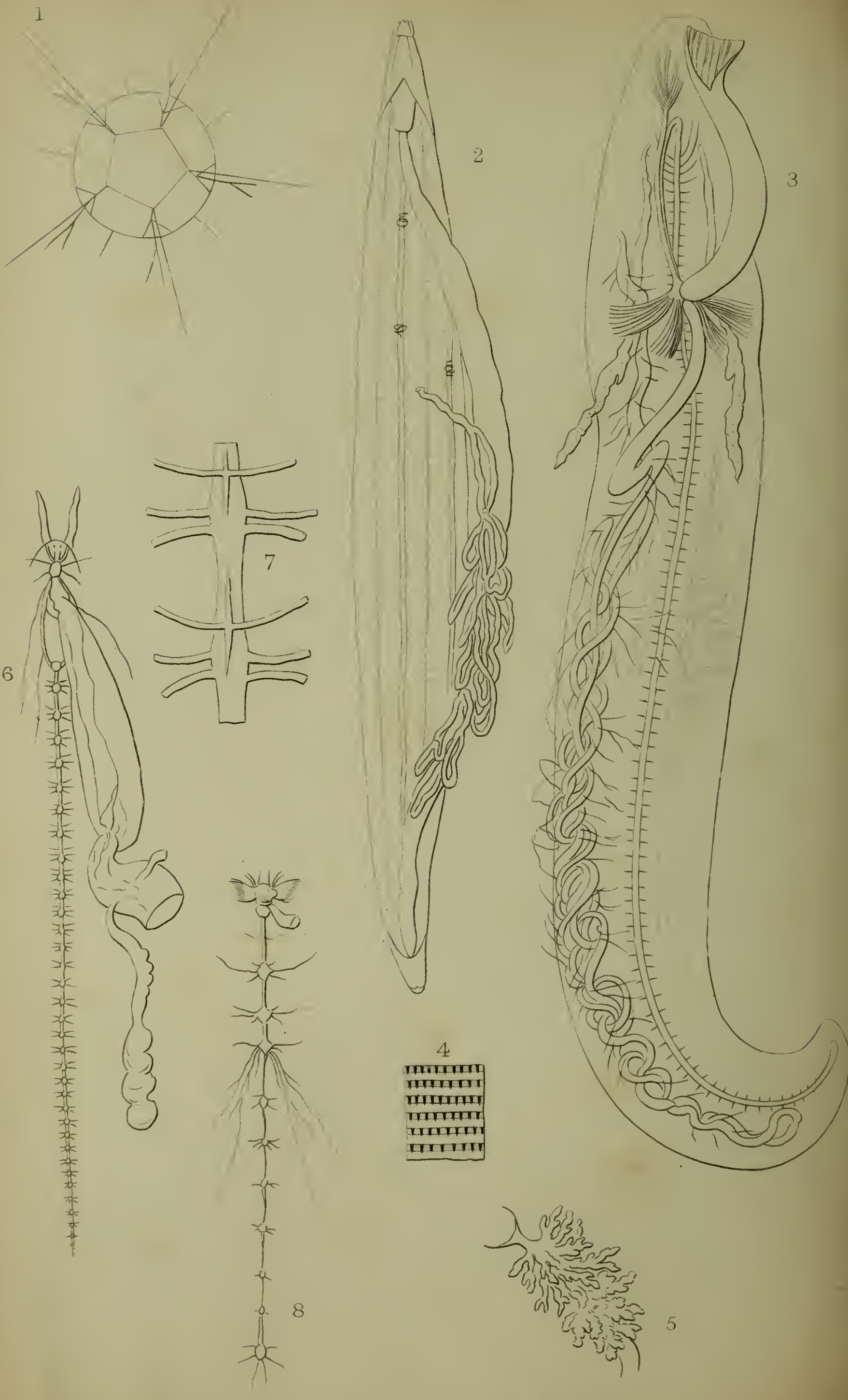
by a piece of moistened lint, without the use of any metal. This, and other experiments, as those of Humboldt, in which contractions took place on simply touching the muscle with the nerve, or connecting the nerve and muscle by another piece of animal tissue, are very interesting, as proving the existence in the nerve and muscle of animals of spontaneous electrical currents. If contractions are produced in a frog's limb, secondary or induced contractions may take place in a second one, having its dissected nerve placed in the muscle of the first; the molecular derangement of the one causing a similar state in the other, according to the well known laws of what is called positive and negative electricity. M. du Bois-Reymond has investigated the law of electrical manifestation in detached muscles and nerves: the longitudinal surface being always positive in respect to the transverse. (Plate IX. Fig. 6.) Nobili, Mateucci, and others, have also advanced this branch of science. The discovery of Œrsted of the effect of a current of electricity around a neighbouring freely suspended magnetic needle, has not only originated the electrical telegraph, but furnished the physiologist with an instrument (Fig. 5), the galvanometer, which may be made by means of the astatic needles, &c., of extreme susceptibility, and in M. du Bois-Reymond's hands, has elucidated the laws of this animal electricity.

The convulsions produced in the limbs of frogs do not take place simply from the amount of electrical fluid, to use so incorrect a term, present in them, but only in consequence of disturbing their electrical equilibrium in breaking or completing the circuit. When electricity acts on the sensuous nerves, as in the experiment of the zinc and silver placed in the mouth, the effect is continuous. It is proved that in sensuous nerves the electro-motor action can be produced peripherally or centrally. A nerve electrified in any part of its course has its electrical state altered, or polarized, throughout the whole of it, called its electro-tonic state. M. du Bois-Reymond produced an effect on a delicate galvanometer by the contraction of his arm ; but this, and other

contractions, do not produce an increase in the effect on the needle caused by the previous electro-motor state of the muscles, but the reverse—a negative deflection in the opposite direction, or rather, perhaps, a cessation of effect, as the small opposite deflection beyond zero may be accounted for by extraneous causes. The total current produced by the electrical state of the different muscles of animals, appears to vary in direction in different species.

The nervous force, in some respects, presents us with an analogy to the electrical, in others it evidently differs from it: sensitive and motor nerves are very easily excited by weak electricity, as is well known; the nervous circle is also very like the electrical one; so also the structure of the encephalon most resembles a galvanic arrangement. On the other hand, other stimulants have a powerful effect in exciting sensations and motor impulse in the nerves, and appear analogous to that of electricity in this respect; no increased action has ever been produced in the galvanometer by connecting it with a large nerve in a state of active excitement, but we may infer the reverse from what has been already observed, the nervous impulse appearing to destroy the natural electrical state; the conducting power of a nerve is not at all identical with that of an electrical wire, a ligature round a nerve stopping the nervous force, but not that of electricity; neither can an electrical conductor be made to take the place of an excised portion of nerve, as far as the nervous impulse is concerned, but only as regards electrical action; nerves, too, are bad conductors of the latter; and the velocity of nervous impulse, and that of electricity, appear to be widely different.* The nervous is the vital power *par excellence*, in relation to, but not identical with, the great physical forces, electricity, magnetism, heat, light, &c., one frequently determining the development of the other.

* Valentin's Text-Book.



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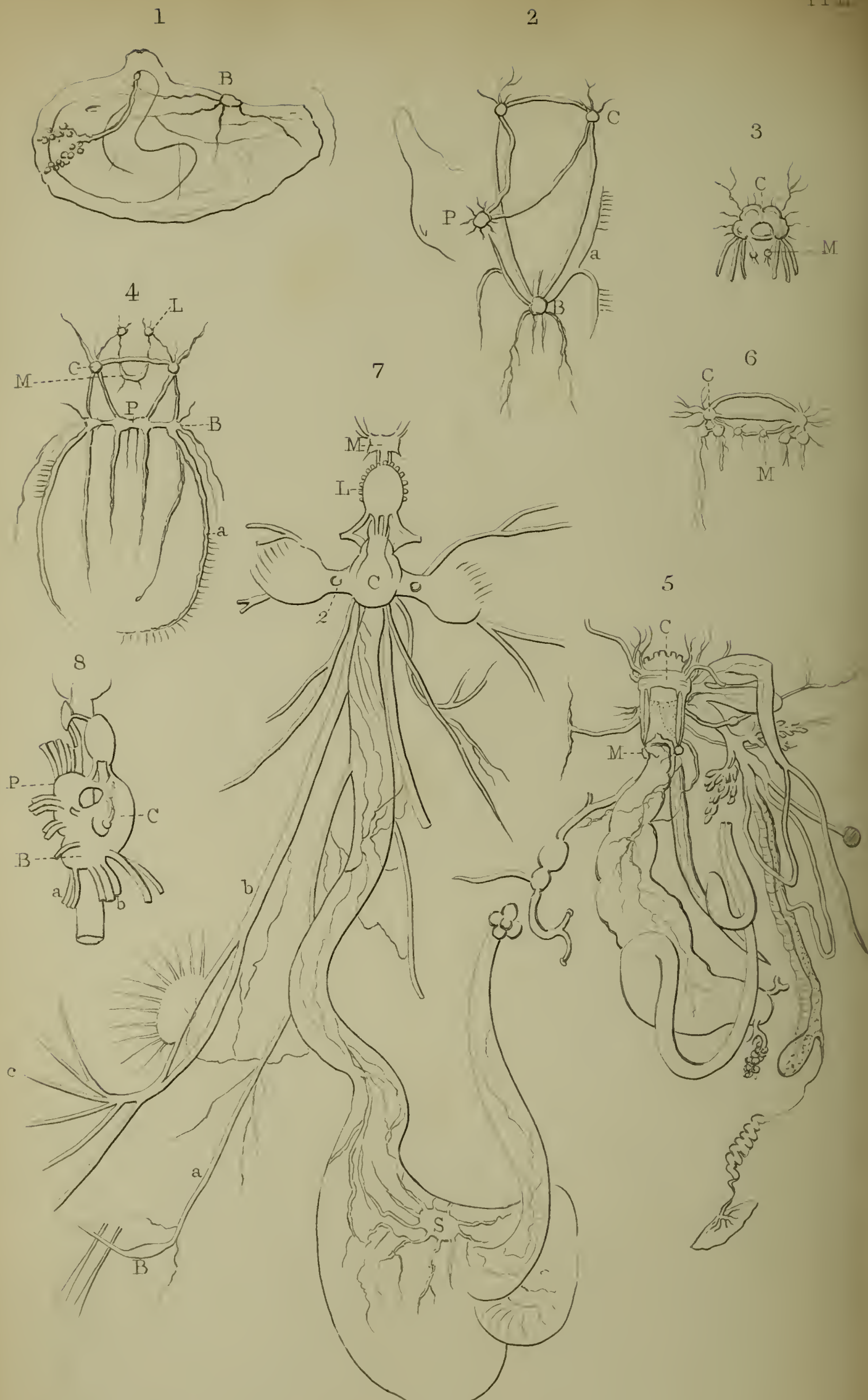

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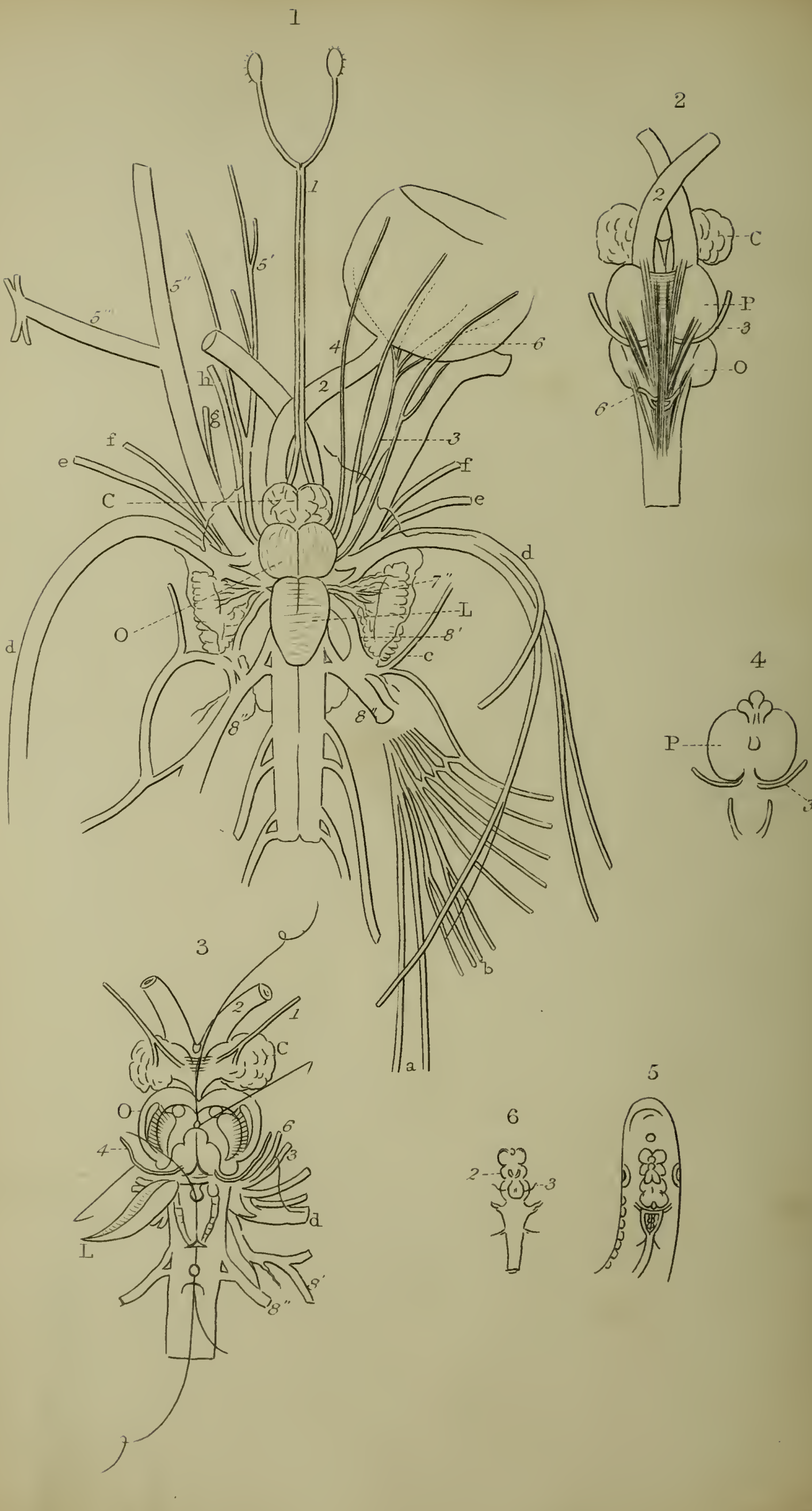

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EXPLANATION OF THE FIGURES.

THE figure of the brain of the turtle is from Bojanus, and that of the monkey from Tiedemann, the rest are from nature. Of the vignettes the first is from Gio. Pichler, the six following from the Greek, and the last from a tablet by Wedgwood and Flaxman. They all relate to the myth of Æsculapius.

PLATE I.

FIGURE 1. Supposed nervous system of a radiated animal (asterias rubens). 2. Ditto of an ascaris from the horse. 3. Nervous system of a species of siphunculus from the West Indies. 4. Interior of the œsophagus of the same. 5. Termination of the intestinal canal of a similar species. 6. Nervous system of the sea-mouse (aphrodite aculeata). 7. Portion of the nervous cord magnified. 8. Nervous system of a large species of dragon-fly (libellula).

PLATE II.

FIG. 1. Nervous system of an ascidia. 2. Ditto of a cockle (cardium echinatum). 3. Ditto of a doris. 4. Ditto of a limpet (patella vulgaris). 5. Ditto of a shell-snail (helix nemoralis). 6. Ditto of bullæa aperta. 7. Nervous system of the cuttle-fish (sepia officinalis). 8. Brain of ditto.

C. Cerebral ganglia. B. Branchial ganglia. P. Pedal or motor ganglia. L. Labial ganglia. M. Maxillary ganglia. S. Sympathetic ganglia. 2. Optic nerves. *a*. Branchial nerves. *b*. Ditto of mantle. *c*. Ditto of fin.

PLATE III.

FIG. 1. Nervous system of the cod (morrhua vulgaris). 2. Structure of the brain below. 3. Ditto above. 4. Pituitary body, &c. 5. Brain of a small species of lamprey (petromyzon Planeri). 6. The same seen from below.

C. Cerebral lobes. L. Cerebellum. O. Optic lobes. P. Pituitary body. 1. Olfactory nerves. 2. Optic nerves. 3. Motores oculorum. 4. Fourth pair. 5′. Ophthalmic nerves of fifth pair. 5″. Superior maxillary ditto. 5‴. Inferior ditto. 6. Sixth nerves. 7′. Facial nerves. 7″. Acoustic nerves. 8′. Glosso-pharyngeal nerves. 8″ Nervi vagi. 8‴. Spinal accessory. 9. Hypoglossal nerves.

[The above letters and figures refer also to the following plates.]

Fig. 1. *a*. Branches of vagus going to the sides of the animal. *b*. Visceral nerves. *c*. Nerve going to the palate. *d*. Large nerve supplying the opening of the gill-flap, the fins, and the sides of the fish, anastomosing with the spinal nerves. *e*. Small branch of the fifth supplying the floor of the mouth, cheek, and lower jaw. *f*. Ditto given to the orbit and integuments over the lip. *g*. Nerve to the muscles below the eye. *h*. A small nerve to the palate. In Fig. 2, fibres are represented as rising from the spinal cord and forming the different cephalic ganglia. In Fig. 3, the internal prominence of the optic lobes is formed by a lamina from the cerebellum, their external coats are formed by the optic nerves.

PLATE IV.

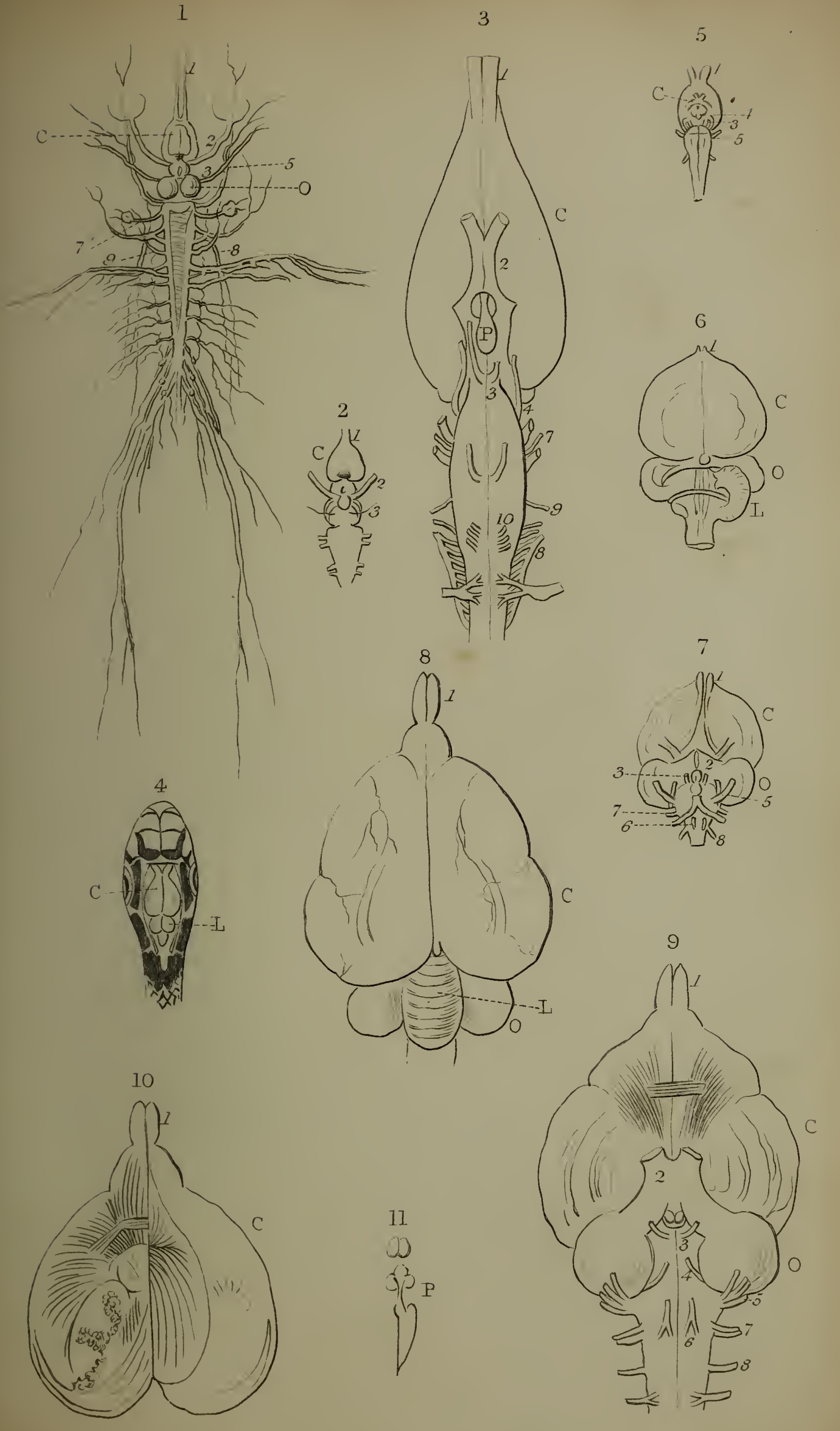
Fig. 1. Nervous system of the common frog. 2. Under surface of its brain. 3. Brain of the tortoise. 4. Brain of a species of harmless snake. 5. Under surface of the same. 6. Brain of the cuckoo. 7. Under surface of ditto dissected, the pituitary body being lodged with the arteries in a bony bifurcated canal. 8. Upper surface of the brain of the goose. 9. Lower ditto. 10. Cerebrum displayed internally. 11. Pituitary body.

PLATE V.

Fig. 1. Brain of a hare, under surface. 2. Ditto, upper surface. 3. Corpora quadrigemina, or optic lobes displayed; *i*. posterior commissure; *j*. anterior ditto. 4. Brain of the squirrel. 5. Ditto of the mole. 6. Under surface of ditto. 7. Internal structure of ditto. 8. Brain of the common bat (verpertilio pipistrellus). 9. Under surface of ditto, with the acoustic nerve entering the cochlea. 10. Brain of the weasel (mustela vulgaris). 11. Under surface of ditto. 12. Brain of the hedgehog. 13 Upper surface of ditto.

PLATE VI.

Fig. 1. Brain of the terrier dog. 2 Side view of ditto. 3. Brain of the domestic cat. 4. Brain of the fox, seen above. 5. Ditto, seen below These figures are somewhat reduced



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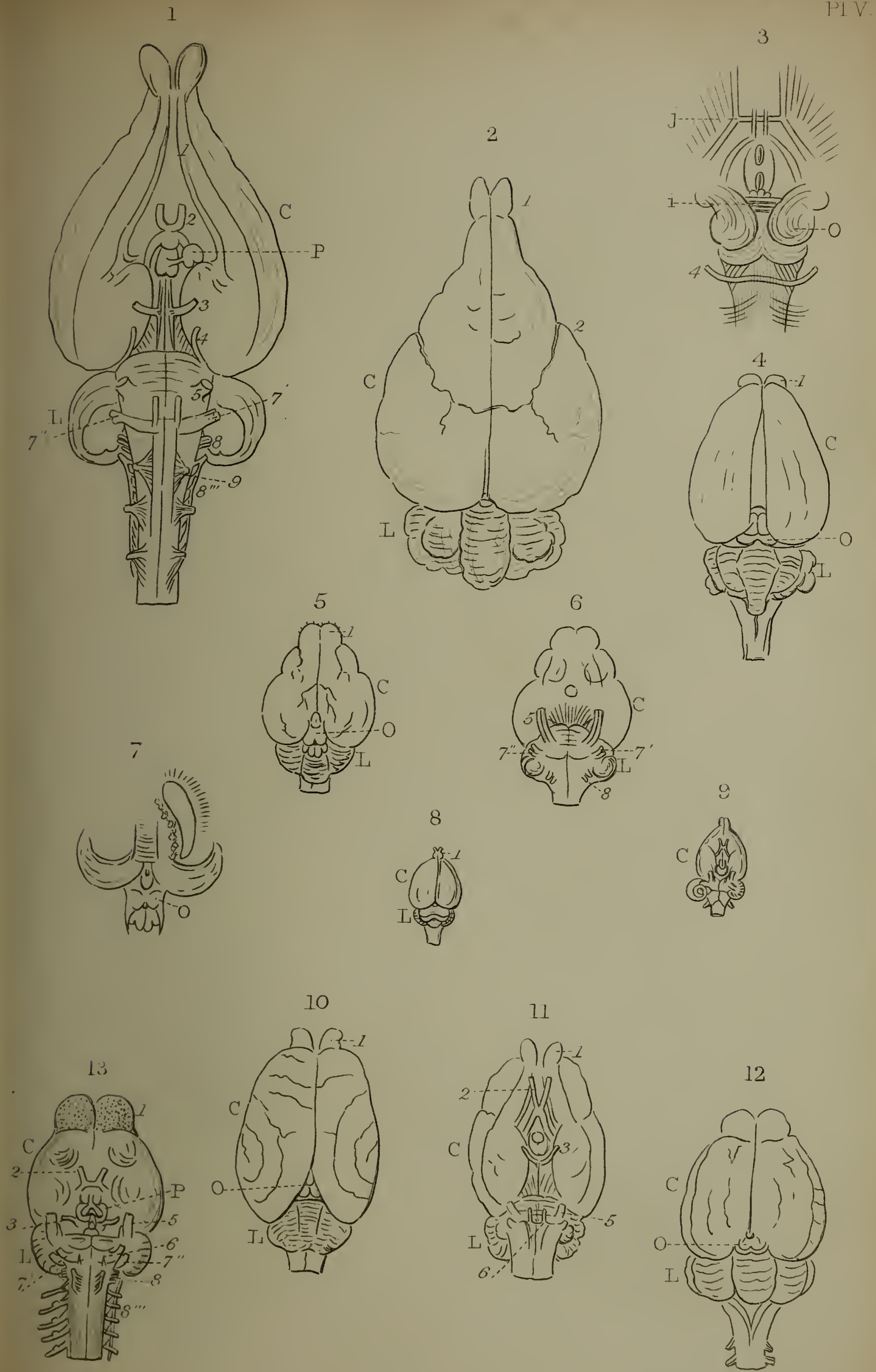
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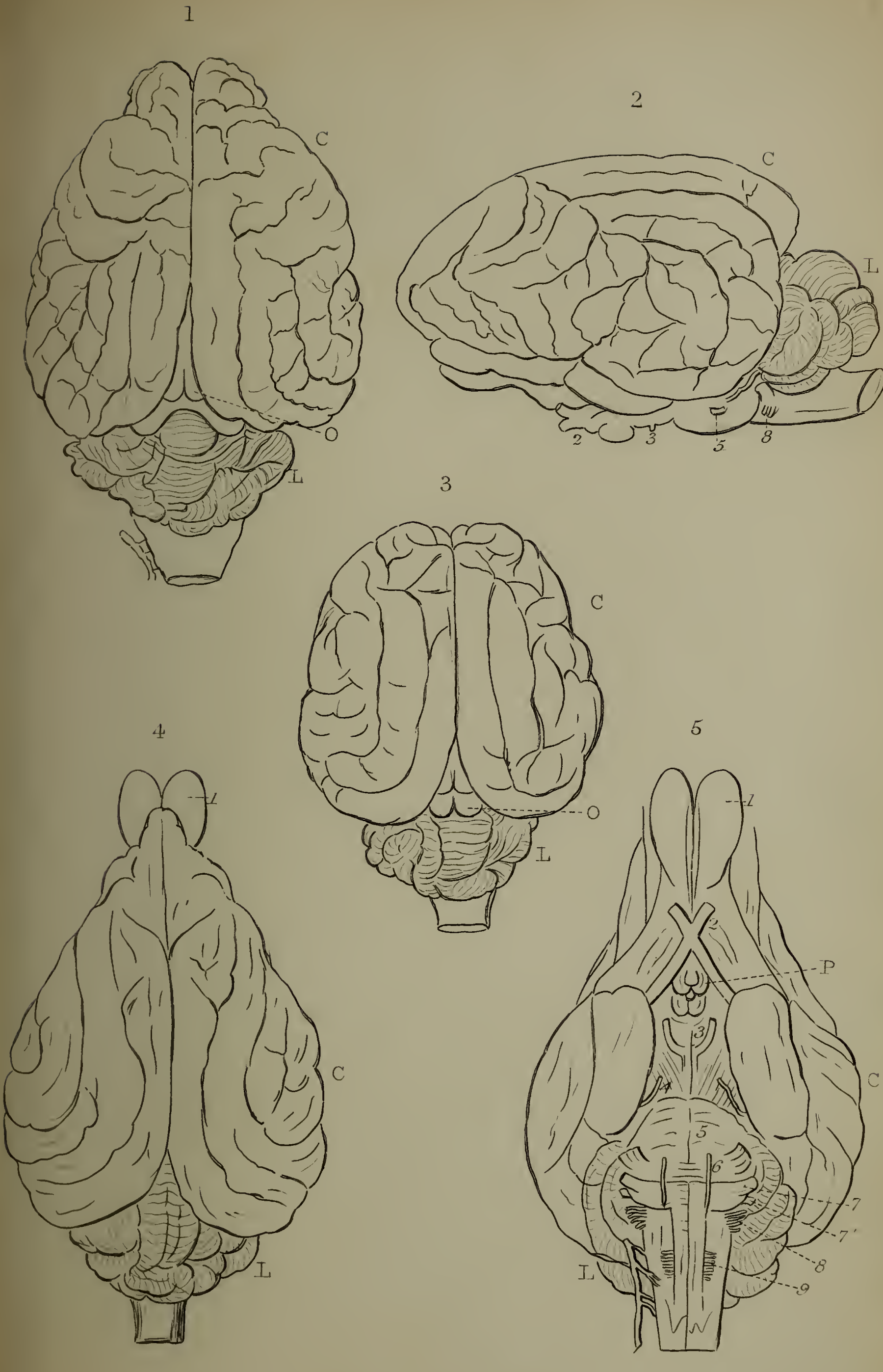
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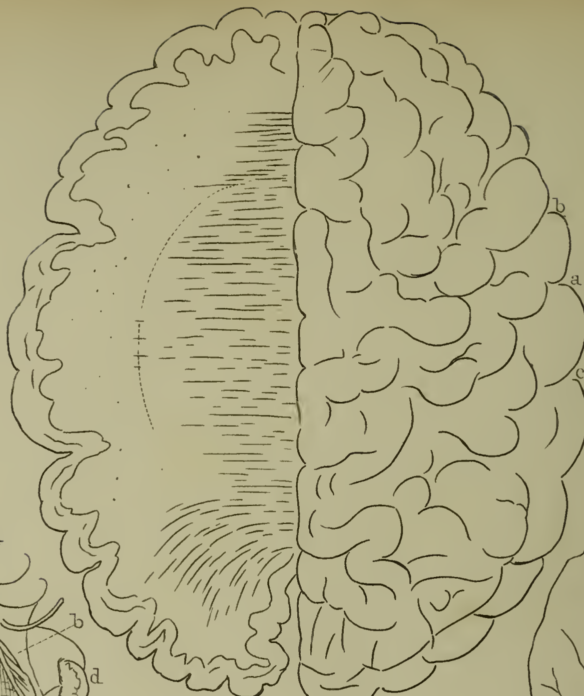

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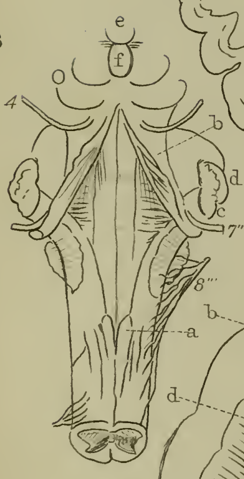

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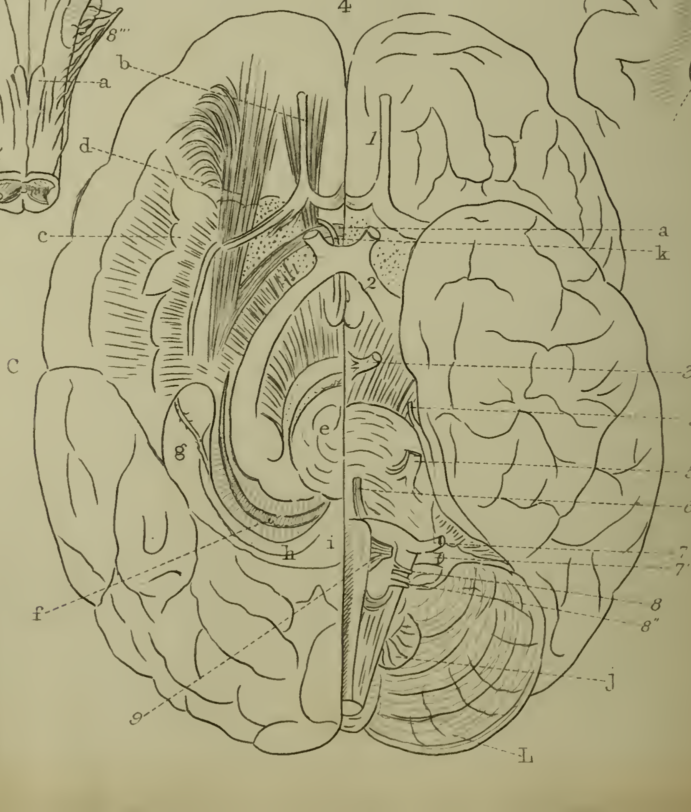

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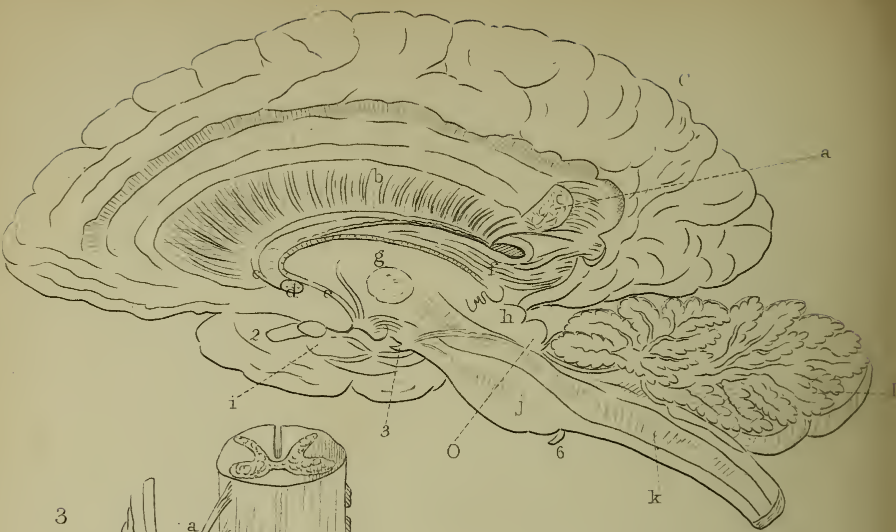

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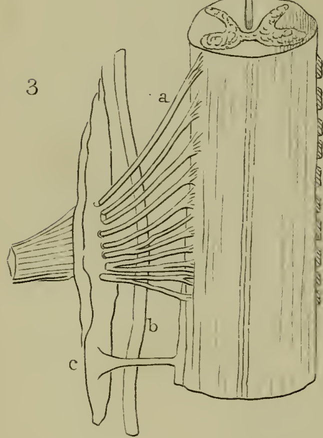

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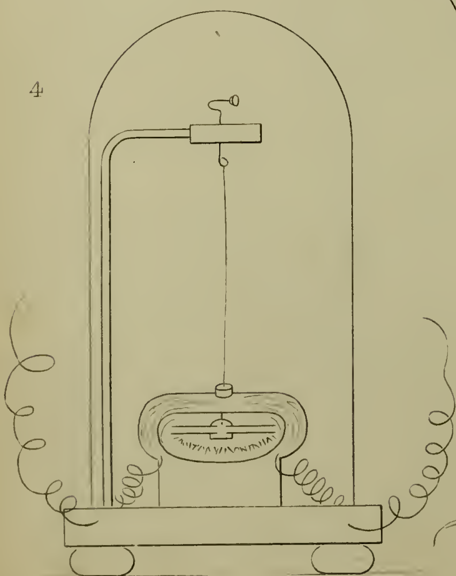

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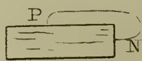

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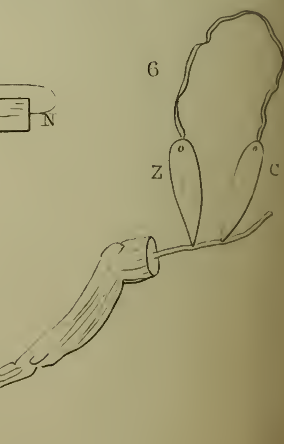

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PLATE VII.

Fig. 1. Brain of the hog, upper surface. 2. Under surface of ditto. 3. Brain of the sheep. 4. Upper surface of the brain of the horse. 5. Under surface of ditto.

These five figures are reduced to about one-half the natural diameter.

PLATE VIII.

Fig. 1. Upper surface of the brain of a middle-aged man; *a.* is continuous with the fissure of Sylvius; *b.* with a sulcus situated before the island of Reil; *c.* with one in the middle lobe. To the left the convolutions are sliced off.

Fig. 2. The island of Reil, as seen in the Sylvian fissure. 3. The human medulla oblongata and fourth ventricle, the cerebellum being removed. *a.* Posterior pyramids. *b.* Valve of Vieussens, forming the middle lobe of the cerebellum. *c.* Posterior crura of the cerebellum, formed by the posterior columns of the cord. *d.* Anterior crura of the cerebellum going to the pons Varolii. *e.* Third ventricle. *f.* Pineal gland.

Fig. 3. The inferior surface of the human brain, to the right, seen as when removed from the skull, to the left dissected to show.—*a.* The anterior commissure and its anterior and posterior fibres. *b.* The olfactory nerve and its roots. *c.* The island of Reil and the course of the fibres through it from the crus of the brain. *d.* Medullary fibres passing between the anterior and middle lobes. *e.* The crus of the brain consisting of the crust before and without, and the tegmentum behind. *f.* The corpus striatum extending into the roof of the descending horn of the lateral ventricle. *g.* The hippocampus; and *h.* corpus fimbriatum, seen descending towards the inferior point of the middle lobe, the latter continued from the fornix *i.*; *j.* the little lobule of the cerebellum or flock appearing to originate the inferior membrane of the fourth ventricle. *k.* The pillar of the fornix descending to the corpus albicans.

PLATE IX.

Fig. 1. A vertical section in the middle line of the human brain, the corpus callosum and its convolutions above being removed, except a small portion, *a*, of the former behind, formed by the posterior lobes. Some of the grey matter of the corpus striatum is removed to show the radiating fibres of the crura. The tænia semicircularis, *c*, is seen dipping before towards the anterior commissure, *d*, as do the pillars of the fornix, *e*,

towards the mamillary bodies. *f*. The fornix covering the velum and running behind into the lateral and posterior horns of the great ventricle. *g*. The soft commissure. *h*. The pineal gland. *i*. The hippocampus. *j*. The pons Varolii. *k*. The spinal cord and its component columns.

The human brain is represented in the above figures at about half its diameter

Fig. 2. Brain of the green monkey (simia sabæus). 3. A portion of the spinal cord in the neck of the ox, seen from behind. *a*. Posterior origins of a nerve. *b*. Spinal accessory. *c*. Theca and its dentate process. *d*. Anterior roots cut short.

Fig. 5. A simple galvanometer, formed by a stand and glass shade, some covered wire, two magnetized needles, reversed in their poles (astatic), and stuck in a scrap of paper, rotating over a graduated card, and suspended by means of a thread of silkworm, a bent pin, and a bit of a cork from a brass rod, the silk passing through a small quill in the coil.

Fig. 6. Representation of a piece of muscle, its natural electricity being negative at its transverse, and positive at its longitudinal surface.

Fig. 7. Figure of the prepared leg of a frog, which may be made to contract when excited, by contact of its nerve with the pieces of zinc and copper.

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